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ABSTRACT

This curriculum guide was developed to complement the Arizona validated competency lists for construction trades. The writing team included tradespeople, secondary vocational educators, community college vocational instructors, and university professors of construction technology programs. The guide lists 15 competencies to be mastered by entry-level electricians. For each competency, various tasks with their standard of performance, conditions for performance, source of the standard, and a performance guide are provided. These materials are intended to assist teachers in secondary and postsecondary vocational programs in developing a course of study, structuring learning sequences, determining standards of performance, and locating resources. The guide also contains a list of tools for an electrician's basic tool kit, and references. (KC)

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ELECTRICAL CURRICULUM

BY

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FOREWORD

The following materials were written at the Arizona Vocational Educator's Curriculum Academy during July and August, 1985. The Electrical competencies, performance objectives, standards and sample performance guides were developed to complement the Arizona validated competency lists for Construction Trades. The writing team included tradespeople, secondary vocational educators, community college vocational instructors and university professors of construction technology programs.

These materials are provided for use in secondary and postsecondary vocational programs to assist teachers in developing course of study, structuring learning sequences, determining standards of performance and locating resources.

In the constantly changing state of construction trades technology, no claim can be made that these materials will ever by truly complete. However, it is the hope of the Academy contributors that instructors will use these materials to enhance the quality of Vocational Education throughout Arizona.

ACKNOWLEDGMENTS

In the development of this document the contributions of the following individuals were greatly appreciated:

Writing Team:

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In addition, we are grateful to Kathy Dunn for her leadership and assistance in getting the final curriculum guide edited and printed.

Don Parsons, Manager
Arizona Center for Vocational Education

Dr. Robert V. Kerwood, Director
Arizona Center for Vocational Education

EXECUTIVE SUMMARY

This document describes building trades curriculum in the following four areas: plumbing, masonry, carpentry, and electrical. For the development of these curriculum materials a group of teachers were selected to convene in Flagstaff, Arizona for a two week Curriculum Academy in July and August, 1985 at the Arizona Center for Vocational Education. The major purpose of the academy was to review the ARizona validated listings of competencies and tasks in building trades and to, then, write curriculum components to support each competency and task. Under the leadership of Dr. Barbara Gutheil, Dr. Linda Loomis, and Charlotte Prickett, teachers from both the secondary and postsecondary educational levels met and sifted through the existing listings of validated competencies and tasks and then further developed the curriculum components. For each competency and task a standard of performance, condition for performance of the task, source of the standard, and performance guide was developed. We hope that you will find these materials both helpful and meaningful to your students and to your vocational building trades program.

TABLE OF CONTENTS

FOREWORD ii

ACKNOWLEDGMENTS iii

EXECUTIVE SUMMARY iv

COMPETENCY

A-1 Use and identify, tools and equipment, to complete work in the electrical trade 1

A-2 Read blueprint and schematics to determine location of work to be done 6

A-3 Compute service loads to meet local code 14

A-4 Select and identify material to meet local code 21

A-5 Install and maintain basic electrical circuits to meet local code 32

A-6 Install lighting fixtures to meet local code 62

A-7 Install and maintain motors to meet local code 68

A-8 Plan and organize work to schedule manpower and materials 73

B-1 Install and maintain service entrance to meet local code 79

B-2 Rough in feeders, branch circuit cables, and circuits to meet local code 91

B-3 Install lighting fixtures to meet local code 119

B-4 Install flush mount junction box 131

B-5 Install environmental control components to meet local code 140

B-6 Trim out electrical devices and appliances to meet local code 150

B-7 Maintain existing wiring to promote longevity and safety of residence 163

ELECTRICIAN'S BASIC TOOL KIT 178

REFERENCES 179

COMPETENCY: A-1 Use and identify, tools and equipment, to complete work in the Electrical Trade

---

PERFORMANCE OBJECTIVE A-1.1

TASK: Select and maintain extension cords.

STANDARD OF PERFORMANCE OF TASK:

Repaired and checked cord safety, per repair order.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Extension cords
Examples of safety approved extension cord
Repair order

PERFORMANCE GUIDE

1. Select extension cord of sufficient current carrying capacity for tool or equipment to be used.
2. Inspect cord for presence of breaks, frays, excessive crimps, all prongs present (male end), all female receptacle openings clear.
3. Replace male/female ends as needed with U.L. approved repair devices.
4. Splice breaks by approved methods.

COMPETENCY: A-1 Use and identify, tools and equipment, to complete work in the Electrical Trade

---

PERFORMANCE OBJECTIVE A-1.2

TASK: Use and maintain hand tools.

STANDARD OF PERFORMANCE OF TASK:

Handled and maintained hand tools, as determined by supervisor.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Examples of proper usage and maintenance
Given situation where hand tool will be used and maintained

PERFORMANCE GUIDE

1. Select right tool for the right job.
2. Handle pointed or sharp tools carefully.
3. Replace tools to proper position in tool storage, or basic tool kit.
4. Sharpen and/or oil tools that require such maintenance.
5. Report defective tools to supervisor.
6. Repair or replace damaged hand tools.

COMPETENCY: A-1 Use and identify, tools and equipment, to complete work in the Electrical Trade

---

PERFORMANCE OBJECTIVE A-1.3

TASK: Select and use personal safety equipment.

STANDARD OF PERFORMANCE OF TASK:

Followed personal safety practices, as determined by job supervisor.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Personal safety equipment
Examples of personal safety
Safety orientation
Given situation where personal safety equipment must be used

PERFORMANCE GUIDE

1. Select correct safety equipment for task to be performed.
2. Use personal safety equipment only for purpose intended.
3. Adjust, repair or replace safety equipment that would otherwise create a safety hazard by failing to protect people.
4. Return personal safety equipment to proper place when finished.

COMPETENCY: A-1 Use and identify, tools and equipment, to complete work in the Electrical Trade

---

PERFORMANCE OBJECTIVE A-1.4

TASK: Operate and maintain power tools.

STANDARD OF PERFORMANCE OF TASK:

Safely operated and maintained power tools, per examples and supervisor observation.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Power tools
Examples of operation and maintenance of power tools
Given situation where power tools must be operated and maintained

PERFORMANCE GUIDE

1. Select correct power tool for task to be performed.
2. Check power tool for cord and other defects.
3. Select proper blade, bit, or cutter, for task to be accomplished.
4. Make sure material to be used is secured so it won't move when being worked.
5. Make sure work area is properly cleared before power tool operation begins.
6. Make sure safety attire is in place before operating power tools.
7. Return power tools to the proper storage place.

COMPETENCY: A-1 Use and identify, tools and equipment, to complete work in the Electrical Trade

---

PERFORMANCE OBJECTIVE A-1.5

TASK: Select and maintain test equipment.

STANDARD OF PERFORMANCE OF TASK:

Selected and maintained test equipment as determined by supervisor.

SOURCE OF STANDARD: Writing team
Mechanical Trades Residential, 1978, p. 82.01

CONDITIONS FOR PERFORMANCE OF TASK:

Test equipment and maintenance instructions
Examples of proper usage of test equipment

PERFORMANCE GUIDE

1. Select proper test equipment to perform desired test.
2. Zero scales/meters if applicable.
3. Check against known conditions to assure test equipment is operating correctly.
4. Repair equipment or perform maintenance as per manufacturers' instructions.

COMPETENCY: A-2 Read blueprint and schematics to determine location of work to be done

---

PERFORMANCE OBJECTIVE A-2.1

TASK: Identify electrical symbols.

STANDARD OF PERFORMANCE OF TASK:

Correctly identify electrical symbols with an accuracy of 90%.

SOURCE OF STANDARD: Writing team

Blueprint Reading -- Appendix (Gebert)

CONDITIONS FOR PERFORMANCE OF TASK:

List of AIA electrical symbols

PERFORMANCE GUIDE:

1. Use symbols resources to identify symbols not recognized.
2. List/draw unknown symbols for personal reference.

COMPETENCY: A-2 Read blueprint and schematics to determine location of work to be done

---

PERFORMANCE OBJECTIVE A-2.2

TASK: Read and interpret scales.

STANDARD OF PERFORMANCE OF TASK:

Determine length of lines from blueprints or scale drawings using the correct architect scale, with an accuracy of 100% to the smallest increment of the scale.

SOURCE OF STANDARD: Writing team

Blueprint Reading (Gebert)
Architectural Design and Engineering -- Chapter 4 (Spence)

CONDITIONS FOR PERFORMANCE OF TASK:

Blueprints
Architects scale

PERFORMANCE GUIDE:

1. Obtain architects scale.
2. Obtain plan to be scaled.
3. Match correct scale to scale of plan.
4. Place nearest whole number on scale over one end of measured line.
5. Read increments "below" zero at other end of measured line.
6. Add increment to whole number for represented dimension.

COMPETENCY: A-2 Read blueprint and schematics to determine location of work to be done

---

PERFORMANCE OBJECTIVE A-2.3

TASK: Read and interpret legends.

STANDARD OF PERFORMANCE OF TASK:

Locate and interpret information from blueprint using the legends with an accuracy of 90%.

SOURCE OF STANDARD: Writing team

Blueprint Reading (Gebert)

CONDITIONS FOR PERFORMANCE OF TASK:

Blueprints

PERFORMANCE GUIDE:

1. Obtain legend from blueprint.
2. Read for information.
3. Verify accuracy with authority or resource.

COMPETENCY: A-2 Read blueprint and schematics to determine location of work to be done

---

PERFORMANCE OBJECTIVE A-2.4

TASK: Identify building components on blueprints.

STANDARD OF PERFORMANCE OF TASK:

Identify materials represented by symbols on the blueprint with an accuracy of 90%.

SOURCE OF STANDARD: Writing team

Architecture Design Engineering and Drawing -- Chapter 4 (Spence)
Blueprint Reading -- Appendix (Gebert)

CONDITIONS FOR PERFORMANCE OF TASK:

Blueprints
List of AIA standardized building symbols

PERFORMANCE GUIDE:

1. Using building plans and specifications, locate and list low-voltage circuit outlets (i.e., door chimes, intercom, smoke detectors, etc.)
2. Using building plans and specifications, locate and list 120 volt circuit outlets (i.e., regular receptacle, switches, etc.).
3. Using building plans and specifications, locate and list 240 volt circuit outlets (i.e., washer/dryer, range, oven, etc.).
4. check voltages and amperages of any/all other circuits.

COMPETENCY: A-2 Read blueprint and schematics to determine location of work to be done

---

PERFORMANCE OBJECTIVE A-2.5

TASK: Read blueprint.

STANDARD OF PERFORMANCE OF TASK:

Necessary building information shall be identified and recorded for dimensions, materials, and related schedules with an accuracy of 90%.

SOURCE OF STANDARD: Writing team

Blueprint Reading (Gebert)

CONDITIONS FOR PERFORMANCE OF TASK:

Blueprints

PERFORMANCE GUIDE:

1. Locate plot plan and find scale of drawing.
2. Locate and record exterior door opening sizes from floor plan.
3. Use architectural scale to estimate the length of kitchen cabinets, from plan elevations.
4. From the section plan, find exterior window heights.
5. From detail plan, extract lineal footage.

COMPETENCY: A-2 Read blueprint and schematics to determine location of work to be done.

PERFORMANCE OBJECTIVE A-2.6

TASK: Figure materials list from blueprint.

STANDARD OF PERFORMANCE OF TASK:

Materials shall be listed carefully and systematically, similar or associated materials shall be grouped together, and final quantities shall be rechecked.

SOURCE OF STANDARD: Writing team

Estimating Electrical Construction -- Chapters 5, 6 (Cole)

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Materials
National Electrical Code
Calculator
Scale rule

PERFORMANCE GUIDE:

1. Check governing codes for guidelines (standards).
2. Locate area for main service panel.
3. Locate and list quantity and sizes of all junction boxes, receptacles and switches.
4. List type and size of wire, required to connect all power sources or outlets.
5. List total length of wire needed per size and type.
6. List all electrical connectors per size and type for hookup.
7. List all finish electrical fixtures and supplies required to complete installation.

COMPETENCY: A-2 Read blueprint and schematics to determine location of work to be done

---

PERFORMANCE OBJECTIVE A-2.7

TASK: Locate and lay out equipment for a job.

STANDARD OF PERFORMANCE OF TASK:

Shop drawings shall be developed to correspond with architectural portion of the blueprint and/or existing construction as per specification requirements.

SOURCE OF STANDARD: Writing team

National Electrical Code
Managing Construction Contracts -- Chapter 19 (Collier)

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Manufacturer's specifications
National Electrical Code

PERFORMANCE GUIDE:

1. Check governing codes for standards.
2. Locate and mark area for main service panel.
3. Using job electricl plan, locate and mark all junction boxes, receptacles, and switches.
4. Locate and mark any special power sources or control circuits.

COMPETENCY: A-2 Read blueprint and schematics to determine location of work to be done

---

PERFORMANCE OBJECTIVE A-2.8

TASK: Determine governing codes.

STANDARD OF PERFORMANCE OF TASK:

Code requirements shall be determined for all electrical circuitry and equipment with an accuracy of 90%.

SOURCE OF STANDARD: Writing team

National Electrical Code
Architectural Design and Engineering -- Chapter 8 (Spence)

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Plans and specifications

PERFORMANCE GUIDE:

1. From National Electrical Code, locate all standards for type of structure to be wired.
2. From electrical plan and specifications find standards for job.
3. Collect local building codes for electrical wiring, and check specifications for structure under consideration.
4. From the above three items, select the standards that take precedence and will be used in wiring the structure.

COMPETENCY: A-3 Compute service loads to meet local code

PERFORMANCE OBJECTIVE A-3.1

TASK: Select location of inside panels and boxes.

STANDARD OF PERFORMANCE OF TASK:

Location of inside panels and boxes meets National Electrical Code, local codes and is conveniently accessible.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Wiring plan
Plans and specifications
National Electrical Code
Local Codes

PERFORMANCE GUIDE

1. Check governing standards.
2. From electrical plan, select the most suitable location for panels/boxes and allocate a minimum number.
3. Check to find most convenient/direct wiring routes.
4. Identify required convenience/appliance outlets per circuit and per panel.
5. Refer to National Electrical Code article 220-2c, governing standard must be met.

COMPETENCY: A-3 Compute service loads to meet local code

PERFORMANCE OBJECTIVE A-3.2

TASK: Determine ground fault circuits required.

STANDARD OF PERFORMANCE OF TASK:

Number of ground fault circuits meets requirements of National Electrical Code and local codes.

SOURCE OF STANDARD: Writing team
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Wiring plan
National Electrical Code
Local code

PERFORMANCE GUIDE

1. Refer to N.E.C. and structure plan and specifications for governing standards.
2. Using governing code, determine number of ground fault circuits required for structure.
3. Using electrical plan, locate most convenient place(s) to install.

COMPETENCY: A-3 Compute service loads to meet local code

PERFORMANCE OBJECTIVE A-3.3

TASK: Determine how many outlets should be in each separate circuit.

STANDARD OF PERFORMANCE OF TASK:

Number of circuits is sufficient to supply the load served.

Number of outlets meets requirements of National Electrical Code (Article 220, example 1, Chapter 9, p. 19).

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Wiring plan
National Electrical Code
Local code

PERFORMANCE GUIDE

1. Allocate a minimum number of appliance circuits according to the National Electrical Code.
2. Choose each circuit and follow the procedure below for determining the number of receptacle outlets required:
   a. Determine the individual branch circuit amperages.
   b. Take 80% of total branch circuit amperages.
   c. Divide the answer in step b. by 1.5 to determine the number of outlets per circuit.
3. Identify required convenience/appliance outlets per circuit. Note: Refer to National Electrical Code Article 220-2c (5).

COMPETENCY: A-3 Compute service loads to meet local code

PERFORMANCE OBJECTIVE A-3.4

TASK: Calculate individual circuit load.

STANDARD OF PERFORMANCE OF TASK:

Circuit load must not total more than the allowed overcurrent device ratings or the current carry capacity of conductors.

Calculations meet requirements of NEC, chapter 9, example 1.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 16
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Floor plan with wiring system
National Electrical Code
Ratings of items of equipment

PERFORMANCE GUIDE

1. Make a list of all possible equipment that is used at one time on an individual circuit.
2. Determine the wattage of all appliances being used or to be installed from the manufacturers' data plate.
3. Total the wattage on that line.
4. Divide the total wattage by the applied voltage to get the total amperage for the circuit load.
5. For light and convenience outlets not calculated as above, allow 1 1/2 amps per outlet.

COMPETENCY: A-3 Compute service loads to meet local code

PERFORMANCE OBJECTIVE A-3.5

TASK: Compute the size of service entrance conductors.

STANDARD OF PERFORMANCE OF TASK:

Calculation of the size of the service entrance conductors must meet requirements as outlined by National Electrical Code (Article 220 and table in Chapter 9).

SOURCE OF STANDARD:

V-TECS: House Electrician, 1981, p. 17

CONDITIONS FOR PERFORMANCE OF TASK:

Wiring plan
National Electrical Code
Local Code
Unit data plate rating
Calculation of entire load, all circuits

PERFORMANCE GUIDE

1. Calculate the general lighting load.
2. Calculate the number of branch circuits required and their load.
3. Calculate the small appliance load.
4. Calculate the laundry load.
5. Calculate the total circuit load without major appliances.
6. Calculate the circuit loads of the major appliances (range, central heat, and air conditioner).
7. Total all circuit wattage load for the total wattage of the house.
8. Divide the total wattage by the applied voltage to 9, National Electrical Code.
9. After determining the total amperes for the load, use the appropriate table from the National Electrical Code to determine entrance cable size.

COMPETENCY: A-3 Compute service loads to meet local code

PERFORMANCE OBJECTIVE A-3.6

TASK: Calculate the load in watts and load current in amps for the entire job.

STANDARD OF PERFORMANCE OF TASK:

Calculation of load in watts and load current in amps shall be within 5% of actual load.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Wiring plan
National Electrical Code
Local code
Ratings of all electrical equipment

PERFORMANCE GUIDE

1. Make a list of the total wattage required on each individual circuit.
2. Total the wattage requirements for all circuits for the entire job.
3. Divide the total wattage by the applied voltage to get the total amperage.
4. Allow 1 1/2 amps per outlet for light and convenience outlets not calculated into the previous wattage calculations.

COMPETENCY: A-3 Compute service loads to meet local code

PERFORMANCE OBJECTIVE A-3.7

TASK: Balance the total load per phase.

STANDARD OF PERFORMANCE OF TASK:

Each phase supplies approximately 1/2 the total load requirement for the 120 volts.

SOURCE OF STANDARD: V-TECS: House Electrician
1981, p. 15
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Floor plan wiring diagram
National Electrical Code
Local code

PERFORMANCE GUIDE

1. Omit all 240 volt circuits from this calculation (ie., range, water heater, central heat, and air).
2. Make a list of all 120 volt circuits (ie., lighting, small appliance, dishwasher, etc.).
3. Determine the wattage of all appliances being used or to be installed from the manufacturers' data plate.
4. Calculate the wattage total per circuit.
5. Divide the total wattage per circuit by the voltage of the circuit to get the ampere per circuit (National Electrical Code, Chapter 9-examples and tables).
6. Load each phase with an equal number of 120 volt circuits based on amperage.
7. Total each phase.
8. Compare totals to determine degree of balance.
9. If they do not balance, redistribute 120 volt loads on phases until approximate balance is reached.

COMPETENCY: A-4 Select and identify material to meet local code

---

PERFORMANCE OBJECTIVE A-4.1

TASK: Identify types of insulation.

STANDARD OF PERFORMANCE OF TASK:

Chose correct type of insulation per plans, specifications and National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Work order

PERFORMANCE GUIDE

1. Using building electrical plan and specifications, list all different types and sizes of wire required.
2. Refer to N.E.C. or governing codes and list approved wire insulation(s) for structure to be wired.

COMPETENCY: A-4 Select and identify material to meet local code

---

PERFORMANCE OBJECTIVE A-4.2

TASK: Identify connectors.

STANDARD OF PERFORMANCE OF TASK:

Selected receptacles per plans and specifications, as well as National Electrical Code.

SOURCE OF STANDARD: National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
National Electrical Code

PERFORMANCE GUIDE

1. Using building electrical plans and specifications, list all different types and sizes of connectors required.
2. Refer to N.E.C. or governing codes and list all approved connectors for structure to be wired.

COMPETENCY: A-4 Select and identify material to meet local code

---

PERFORMANCE OBJECTIVE A-4.3

TASK: Determine panelboards.

STANDARD OF PERFORMANCE OF TASK:

Panelboard installation must meet the requirements as outline by National Electrical Code.

SOURCE OF STANDARD: V-TECS: House Electrician
1981, p. 40
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Panelboards
Electrician's basic tool kit
Plans and specifications
Installation materials

PERFORMANCE GUIDE

1. Refer to N.E.C. and structure plans and specifications for governing standards.
2. Using governing code, determine panelboard(s) required for structure.

COMPETENCY: A-4 Select and identify material to meet local code

---

PERFORMANCE OBJECTIVE A-4.4

TASK: Determine type and size for splice and device boxes and covers.

STANDARD OF PERFORMANCE OF TASK:

Located type and size for splice and device boxes/covers, per plans and specifications.

Type and size of splice and device boxes meets National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications

PERFORMANCE GUIDE

1. Using building electrical plans and specifications, list type and size for splice/device boxes and covers.
2. Refer to N.E.C. or governing codes and list approved type and size of all splice/device boxes and covers for structures to be wired.

COMPETENCY: A-4 Select and identify material to meet local code

---

PERFORMANCE OBJECTIVE A-4.5

TASK: Determine required physical protection of conductors.

STANDARD OF PERFORMANCE OF TASK:

Selected proper conductors and installed providing correct physical protection per plans, specifications and National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Plans and specifications
Installation materials
Work order

PERFORMANCE GUIDE

1. Using building electrical plans and specifications, trace most direct routes from service panel(s) to splice and device boxes.
2. Refer to N.E.C. or governing codes and on plan to locate each place physical protection of conductors is required and list what type of protection conductors must have for each location.

COMPETENCY: A-4 Select and identify material to meet local code

---

PERFORMANCE OBJECTIVE A-4.6

TASK: Select receptacles.

STANDARD OF PERFORMANCE OF TASK:

Applied proper connectors per plans and specifications, as well as National Electrical Code.

SOURCE OF STANDARD: National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Plans and specifications
Work order

PERFORMANCE GUIDE

1. Refer to N.E.C. and structure plan and specifications for governing standards.
2. Using governing code, determine type, size, and quantity of receptacles required for structure.

COMPETENCY: A-4 Select and identify material to meet local code

---

PERFORMANCE OBJECTIVE A-4.7

TASK: Select type and size of wire.

STANDARD OF PERFORMANCE OF TASK:

Selected correct type and size of wire per plans and specifications.

Type and size of wire meets National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit

PERFORMANCE GUIDE

1. Using building electrical plan and specifications, list all different type(s) and size(s) of wire required for structure.
2. Refer to N.E.C. or governing codes and list all approved type(s) and size(s) of wire for structure to be wired.

COMPETENCY: A-4 Select and identify material to meet local code

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PERFORMANCE OBJECTIVE A-4.8

TASK: Select mounting devices.

STANDARD OF PERFORMANCE OF TASK:

Chose proper mounting devices per plans and specifications, and the National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Given a situation where mounting devices are to be used

PERFORMANCE GUIDE

1. Using building plan and specifications, list all different type(s) and size(s) of mounting devices required for structure.
2. Refer to N.E.C. or governing codes and list all approved type(s) and size(s) of mounting devices for structure to be wired.

COMPETENCY: A-4 Select and identify material to meet local code

---

PERFORMANCE OBJECTIVE A-4.9

TASK: Select equipment disconnects.

STANDARD OF PERFORMANCE OF TASK:

Equipment disconnects must meet requirements as outlined by National Electrical Code.

SOURCE OF STANDARD: V-TECS: House Electrician
1981, p. 42
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Electrical disconnects
Electrician's basic tool kit
Installation materials
Plans and specifications

PERFORMANCE GUIDE

1. Using building electrical plan and specifications, list all equipment disconnects required for structure.
2. Refer to N.E.C. or governing codes and on plan to locate all equipment disconnects for structure to be wired.

COMPETENCY: A-4 Select and identify material to meet local code

---

PERFORMANCE OBJECTIVE A-4.10

TASK: Select ground fault protection.

STANDARD OF PERFORMANCE OF TASK:

Selected correct ground fault unit per plans and specifications, as well as National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
National Electrical Code

PERFORMANCE GUIDE

1. Refer to N.E.C. and structure plan and specifications for governing standards.
2. Using governing code, determine number of ground fault circuits required for structure.
3. Using electrical plan, locate most convenient place(s) to install.

COMPETENCY: A-4 Select and identify material to meet local code

---

PERFORMANCE OBJECTIVE A-4.11

TASK: Select service entrance.

STANDARD OF PERFORMANCE OF TASK:

Service entrance panel installed per National Electrical Code Standards.

SOURCE OF STANDARD: Writing team
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Plans and specifications
Installation materials
Service entrance

PERFORMANCE GUIDE

1. Refer to N.E.C. and structure plan and specifications for governing standards.
2. Using governing code, determine the type and size of service panel required for structure.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.1

TASK: Clean equipment.

STANDARD OF PERFORMANCE OF TASK:

Equipment cleaned per work order, plans, and specifications not to override National Electrical Code standards.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Electrician's basic tool kit
Plans and specifications
Work order
Examples of cleaned equipment

PERFORMANCE GUIDE

1. Locate equipment to be cleaned.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Remove dust or other material that interferes with required operation.
5. If using a contact cleaner, apply only as approved by N.E.C.
6. Turn power on.
7. Assure required operation of equipment.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.2

TASK: Lubricate equipment.

STANDARD OF PERFORMANCE OF TASK:

Lubricate equipment per work order, plans, codes and specifications.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Examples of lubricate equipment
National Electrical Code
Electrician's basic tool kit
Plans and specifications
Work order

PERFORMANCE GUIDE

1. Locate equipment to be lubricated.
2. Turn power off.
3. Lubricate using only N.E.C. or manufacturers' approved lubrication application.
4. Turn power on.
5. Assure required operation of equipment.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

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PERFORMANCE OBJECTIVE A-5.3

TASK: Prepare conductors for pulling.

STANDARD OF PERFORMANCE OF TASK:

Conductors prepared for pulling per work order, plans and specifications.

SOURCE FOR STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Plans and specifications
Work Order

PERFORMANCE GUIDE

1. Using plans and specifications, locate conduits for conductors and stock proper size and insulation of wire required for that conduit.
2. Strip and prepare conductors for pulling.
3. Clear area of any obstruction to pulling conductors.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.4

TASK: Use fish tapes.

STANDARD OF PERFORMANCE OF TASK:

Use fish tape to accomplish work order, per plans and specifications.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Plans and specifications
Work order

PERFORMANCE GUIDE

1. Using governing standards, check conductors to see if they are of the correct type and size and that the percent of fill will not be exceeded.
2. Apply approved lubricant to fish tape.
3. Insert fish tapes into conduits or bored holes.
4. Push fish tape from box at one end of run and out through the box at the other end.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.5

TASK: Pull conductors.

STANDARD OF PERFORMANCE OF TASK:

Pulled conductors per work order, plans and specifications.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Work order

PERFORMANCE GUIDE

1. Recheck for proper size, type and number of conductors per governing code before pulling begins.
2. Attach fish tape securely.
3. Allow fish tape to move through conduit without excessive force or speed.
4. When conductors are pulled through conduit, disconnect fish tape (snake), allowing 6" length extended from conduit opening.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.6

TASK: Splice conductors.

STANDARD OF PERFORMANCE OF TASK:

Spliced conductors per work order, plans, specifications and National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Work order

PERFORMANCE GUIDE

1. Using governing codes, splice conductors at correct points.
2. Only N.E.C. or local code approved splicing and locations.
3. Make sure all connections are tight.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.7

TASK: Terminate conductors.

STANDARD OF PERFORMANCE OF TASK:

Secured conductors per work order, plans, specifications and National Electrical Code.

Using governing codes, terminate conductors at assigned locations with sufficient length for interconnections.

All connections are to be tight and of approved type and size.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Work order

PERFORMANCE GUIDE

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

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PERFORMANCE OBJECTIVE A-5.8

TASK: Connect conduits and other raceways.

STANDARD OF PERFORMANCE OF TASK:

Connectors installed to meet National Electrical Code, completed within 45 minutes and wrench tight.

SOURCE OF STANDARD:

Mechanical Trades (Residential) Electrician

CONDITIONS FOR PERFORMANCE OF TASK:

Residence (or other) to be wired
Electrician's basic tool kit
Conduit and other raceways
Connectors

PERFORMANCE GUIDE

1. Using building electrical plan and specifications, review installation requirements.
2. Select proper conduit/raceway fittings and accessories, per governing code.
3. Install conduit/raceway according to N.E.C. 345, 346 and 348 and per prints and specifications.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

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PERFORMANCE OBJECTIVE A-5.9

TASK: Support conduits and other raceways.

STANDARD OF PERFORMANCE OF TASK:

Conduits and raceways are secure to withstand normal abuse, they are in compliance with National Electrical Code and they are installed within one hour.

SOURCE OF STANDARD:

Mechanical Trades (Residential) Electrician, C-3.00.02
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Residence (or other) to be wired
Conduits or other raceways
Hangers and other support devices

PERFORMANCE GUIDE

1. Using governing codes, install and support conduit according to N.E.C. 345, 346 and 348.
2. Use typical raceway support devices such as steel conduit clamps, two-hole clamps, etc. as appropriate.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.10

TASK: Bend conduits.

STANDARD OF PERFORMANCE OF TASK:

All bends met National Electrical Code.
All bends complete within 45 minutes.

SOURCE OF STANDARD:

Mechanical Trades (Residential) Electrician

CONDITIONS FOR PERFORMANCE OF TASK:

Measured conduit run and bend
Electrician's basic tool kit
Hickey (conduit bender)
Length of conduit

PERFORMANCE GUIDE

1. Using building electrical plans and specifications, measure for conduits/raceways and mark all bends.
2. Review installation requirements per governing codes.
3. Select conduit size and proper fittings and accessories according to N.E.C. 348.
4. Assemble materials and equipment.
5. Make required conduit bends:
   a. Heat conduit (N.E.C. 347-6).
   b. Form bends (N.E.C. 347-13).
   c. Cool conduit (N.E.C. 347-5).

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

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PERFORMANCE OBJECTIVE A-5.11

TASK: Measure conduits and other raceways.

STANDARD OF PERFORMANCE OF TASK:

Measurement of installation length is accurate within +- 1/8".

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Residence (or other) to be wired
Electrician's basic tool kit

PERFORMANCE GUIDE

1. Using building electrical plan and specifications, make measurements for conduits/raceways.
2. Determine conduit size for specified conduit fills.
3. Select proper conduit fasteners and materials per governing codes.
4. Transfer measurements to conduits/raceways.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

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PERFORMANCE OBJECTIVE A-5.12

TASK: Mount devices of apparatus in enclosures.

STANDARD OF PERFORMANCE OF TASK:

Devices mounted securely and in compliance with National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Work order

PERFORMANCE GUIDE

1. Using building electrical plan and specifications, review installation requirements.
2. List type(s) and size(s) of devices of apparatus to be installed in enclosures.
3. Using governing codes, install devices of apparatus in enclosures.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.13

TASK: Mount enclosures.

STANDARD OF PERFORMANCE OF TASK:

Enclosures are mounted securely according to National Electrical Code.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Residence or other to be wired
Plans and specifications
Appropriate enclosures

PERFORMANCE GUIDE

1. Using building electrical plan and specifications, review enclosure installation requirements.
2. From plan and specifications, list enclosures to be mounted and location of each.
3. Assemble materials and install enclosures using adequate number of appropriate fasteners.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

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PERFORMANCE OBJECTIVE A-5.14

TASK: Test installations for required voltage.

STANDARD OF PERFORMANCE OF TASK:

Tested installations for required voltage according to plans, specifications and the National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Electrician's basic tool kit
Test equipment
Wiring system

PERFORMANCE GUIDE

1. Using building electrical plan and specifications, locate installation circuits (ie. line, receptacle, switch, etc.) to be tested.
2. Determine proper/required voltage.
3. Turn power on.
4. Check voltage with voltmeter at each circuit.
5. Check each circuit (outlets) for correct polarity.
6. If short, open, or faulty circuit has been identified, cut power off; check with meter; repair if necessary.
7. Assure required operation of each circuit installation.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.15

TASK: Test amperages.

STANDARD OF PERFORMANCE OF TASK:

Tested amperage in wired system according to plans, specifications and the National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Electrician's basic tool kit
Plans and specifications
Wired system
Test equipment

PERFORMANCE GUIDE

1. Using building electrical plan and specifications, locate installation circuits (line, receptacle, switch, etc.) to be tested.
2. Determine proper/required amperages.
3. Turn power on.
4. Check amperage with ammeter at each circuit.
5. If short, open, or faulty circuit has been identified; cut power off; repair if necessary.
6. Assure required operation of each circuit installation.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.16

TASK: Test apparatus for operation.

STANDARD OF PERFORMANCE OF TASK:

Tested apparatus per specifications and per National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Electrician's basic tool kit
Test equipment
Plans and specifications
Wired apparatus for testing

PERFORMANCE GUIDE

1. Using building electrical plan and specifications, locate installation circuits for apparatus (line, receptacle, switches, equipment, etc.) to be tested.
2. Determine proper/required voltages and amperages.
3. Turn power on.
4. Check all circuits with a multimeter for amperage and voltage.
5. Check each circuit for correct polarity.
6. If short, open, or faulty circuit has been identified: a) cut power off, b) repair/replace if necessary.
7. Retest until assured operation of each circuit installation is per governing codes.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.17

TASK: Record electrical data.

STANDARD OF PERFORMANCE OF TASK:

Extracted and recorded information from plans, specifications and National Electrical Code standards.

SOURCE OF STANDARD: Writing team
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
National Electrical Code
Given a situation where information must be extracted
Recordkeeping system

PERFORMANCE GUIDE

1. Using building electrical plan and specifications, record:
   a. Wire conductors type and size.
   b. Mounting devices type, size and quantity.
   c. Installation circuits (line receptacle, switches, etc.)
   d. Determined voltages and amperages.
2. Test and record voltage and amperage for each circuit in wired structure.
3. Use industry format to express all data.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.18

TASK: Test installations for mechanical integrities.

STANDARD OF PERFORMANCE OF TASK:

Mechanical integrities tested per plans, specifications, and National Electrical Code standards.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Electrician's basic tool kit
Plans and specifications
Test equipment
Installations to be tested

PERFORMANCE GUIDE

1. Using building electrical specifications, locate installation circuits (lines, receptacles, switches, etc.) to be tested.
2. Assure required operation of each circuit, so that mechanical integrities exist in structure.
3. Refer to code or manufacturers' instructions to correct problems.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.19

TASK: Check for overloaded circuits.

STANDARD OF PERFORMANCE OF TASK:

Systems checked for open circuits, short circuits, correct voltage and correct polarity.

All connections tight and functioning.

Work complies with National Electrical Code.

SOURCE OF STANDARD:

V-TECS: House Electrician, 1981, p. 75

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Electrician's basic tool kit
Work order
Given an overloaded circuit

PERFORMANCE GUIDE

1. Turn power on/off, as required.
2. Locate power source and the route of the circuit to be checked.
3. Remove all cover plates.
4. Check all connections.
5. Check voltage at each outlet.
6. Check each outlet for correct polarity.
7. If short or faulty circuit: Cut off power; repair/replace faulty part.
8. Recheck to assure circuit is not overloaded.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.20

TASK: Wire series circuits.

STANDARD OF PERFORMANCE OF TASK:

The sum of voltages across individual components equals the voltage applied to the circuit.

The largest voltage drop occurs in the component with the highest resistance.

Current is the same through all components.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Wiring system materials
Test equipment

PERFORMANCE GUIDE

1. Using a diagram of a series circuit, list type and size of conductors required and approved connectors.
2. Assemble components to complete series circuit per diagram.
3. Turn power on.
4. Test series circuit, if current is the same through all parts, wiring is correct.
5. The largest voltage drop occurs at component with highest resistance.
6. The sum of voltages across individual components equals voltage applied to series circuit.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.21

TASK: Wire parallel circuits.

STANDARD OF PERFORMANCE OF TASK:

Parallel circuits wired so voltage same across all branches, and total power consumed equals sum of power consumed in the branches.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Test equipment
Wiring system materials

PERFORMANCE GUIDE

1. Using a diagram of a parallel circuit, list type and size of conductors required and approved connectors.
2. Assemble components to complete parallel circuit, per diagram.
3. Turn power on.
4. Test parallel circuit:
   a. Same voltage across components.
   b. Total current is sum of all branch currents.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.22

TASK: Wire combined series - parallel circuits.

STANDARD OF PERFORMANCE OF TASK:

Series circuits have current same through all components in system.

Parallel circuits have voltage same across all branches.

SOURCE OF STANDARDS: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Wiring system materials
Test equipment

PERFORMANCE GUIDE

1. Using a diagram of a combination parallel and series circuit, list type and size of conductors required and approved connectors.
2. Assemble components to complete parallel-series circuit, per diagram.
3. Test assembled per diagram, for:
   a. Series circuit correctly wired (same current flows through all components).
   b. Parallel circuit correctly wired (same voltage across components.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.23

TASK: Replace fuses.

STANDARD OF PERFORMANCE OF TASK:

Fuses replaced meet the requirement as outlined by the National Code.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 68
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

Assortment of fuses
National Electrical Code
Electrician's basic tool kit
Work order

PERFORMANCE GUIDE

1. Locate installation.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at point of connection(s) with voltage tester.
4. Remove fuse.
5. Replace with comparable amperage.
6. Assure required operation.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.24

TASK: Replace circuit breakers.

STANDARD OF PERFORMANCE OF TASK:

Circuit breakers must be of required size and type labeled for use in panel fully inserted with the busses.

SOURCE OF STANDARD: National Electrical Code, 1984
V-TECS: Electrician, 1981, p. 66

CONDITIONS FOR PERFORMANCE OF TASK:

Circuit breakers
National Electrical Code
Electrician's basic tool kit

PERFORMANCE GUIDE

1. Turn power off.
2. Determine that power is off by checking conductor(s) at the point of connections) with voltage tester.
3. Remove one breaker from panel.
4. Remove conductor from old breaker.
5. Connect new breaker to conductor.
6. Install breaker to panel.
7. Replace each breaker in the same manner.
8. Turn power on.
9. Assure required operation.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.25

TASK: Replace worn out components.

STANDARD OF PERFORMANCE OF TASK:

Replaced components must meet the requirements as outlined by the National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984
V-TECS: Electrician, 1981, p. 65

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Electrician's basic tool kit
Work Order
Replacement components

PERFORMANCE GUIDE

1. Turn off power.
2. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
3. Remove wornout component(s).
4. Remove conductor from old component.
5. Connect new component to conductor.
6. Install component in proper location.
7. Replace each wornout component in the same manner. Note: Read manufacturers' instructions for unfamiliar parts.
8. Turn power on.
9. Assure required operation.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.26

TASK: Repair door chimes.

STANDARD OF PERFORMANCE OF TASK:

Repaired door chimes per work order, plans, specifications and National Electrical Code.

Button at each location must cause chime to operate.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Electrician's basic tool kit
Work order
Chimes or replacement parts
Plans and specifications

PERFORMANCE GUIDE

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturers' installation instructions.
5. Reattach chime unit to structure.
6. Reconnect low-voltage wiring connections.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.27

TASK: Repair heating system controls.

STANDARD OF PERFORMANCE OF TASK:

Repaired heating system controls per work order, plans, and specifications, as well as National Electrical Code.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Electrician's basic tool kit
Test Equipment
Work Order
Controls for heating system to be repaired
Plans and specifications

PERFORMANCE GUIDE

1. Locate heating system control installation.
2. Check governing electrical standards.
3. Read manufacturers' repair instructions.
4. Turn power off.
5. Check to see that all connections are tight.
6. Turn power on, test circuit.
7. If short, open, or faulty component has been identified: a) cut power off, b) repair/replace as necessary.
8. Turn power on.
9. Assure required operation.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.28

TASK: Repair fire alarm stations.

STANDARD OF PERFORMANCE OF TASK:

Repaired fire alarm station, per National Electrical Code standards.

SOURCE OF STANDARD: Writing team
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Electrician's basic tool kit
Work order
Repair materials for fire alarm stations
Test equipment

PERFORMANCE GUIDE

1. Locate fire alarm installation.
2. Check governing electrical standards.
3. Read manufacturers' repair instructions.
4. Turn power off.
5. Determine that power is off by checking conductor(s) at point of connection(s) with test equipment.
6. Check to see that all connections are tight.
7. Turn power on, test circuit.
8. If short, open, or faulty component has been identified: a) cut power off, b) repair/replace as necessary.
9. Turn power on.
10. Assure required operation.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

---

PERFORMANCE OBJECTIVE A-5.29

TASK: Replace motors.

STANDARD OF PERFORMANCE OF TASK:

Replaced and tested motor per work order, plans, specifications, and National Electrical Code standards.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Electrician's basic tool kit
Plans and specifications
Work order
Manufacturer's specifications
Replacement motor
Test equipment

PERFORMANCE GUIDE

1. Locate motor to be replaced.
2. Read manufacturers' installation instructions and schematic drawing.
3. Check to see that replacement motor has equivalent horse power and operating voltage/amperage.
4. Disconnect mechanical connections (ie. belt, brackets, wiring, etc.) from motor to be replaced.
5. Reconnect replacement motor (ie. wiring, brackets, belt, etc.).
6. Check to see that all connections are secure.
7. Turn power on.
8. Assure required operation.

COMPETENCY: A-5 Install and maintain basic electrical circuits to meet local code

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PERFORMANCE OBJECTIVE A-5.30

TASK: Adjust apparatus and devices to specifications.

STANDARD OF PERFORMANCE OF TASK:

Met specifications of plans, specifications and National Electrical Code standards.

SOURCE OF STANDARD: Writing team
National Electrical Code, 1984

CONDITIONS FOR PERFORMANCE OF TASK:

National Electrical Code
Electrician's basic tool kit
Plans and specifications
Apparatus and devices to be adjusted

PERFORMANCE GUIDE

1. Using building electrical plan and specifications, locate and identify all electrical devices and apparatus.
2. Check governing electrical standards.
3. Test each circuit for current draw and correct polarity.
4. Adjust any devices that do not comply with governing codes.
5. Assure required operation of apparatus and devices.

COMPETENCY: A-6 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE A-6.1

TASK: Select and install lighting control devices.

STANDARD OF PERFORMANCE OF TASK:

1. Lighting control devices located and installed per plans and specifications.
2. System installed, works when power is turned on.
3. Meets National Electrical Code standards.

SOURCE OF STANDARD: National Electrical Code
V-TECS: House Electrician, 1981, p. 60
Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Lighting control devices
Power source
Wired system
Installation materials
Electrician's basic tool kit

PERFORMANCE GUIDE:

1. Locate light to receive photo-electric control.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Take light down.
6. Check light for a knockout that will accept the photo cell. If none exists, use drill or other means to make the desired hole.
7. Attach photo-electric control to light base.
8. Connect wire ends per manufacturer's installation instructions.
9. Hang light.
10. Turn power on.
11. Test according to manufacturer's installation instructions.
12. If instructions are not supplied:
    a. Place a dark covering over cell lens. Light should come on in approximately three minutes.
    b. Remove dark covering. Light should stop burning in approximately three minutes.

COMPETENCY: A-6 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE A-6.2

TASK: Select and install light dimmer system.

STANDARD OF PERFORMANCE OF TASK:

Located and installed, with connections tight.
Operates within predetermined tolerances.
Meets National Electrical Code standards.

SOURCE OF STANDARD: National Electrical Code
V-TECS: House Electrician, 1981, p. 30

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Plans and specifications
Light dimmer system
Manufacturer's specifications
Installation/electrical materials
Wired system
Power source

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Examine the dimmer to be sure it is the proper type and size for the application (fluorescent or incandescent).
6. Examine the mounting boxes and circuit conductors to be sure they are correct.
7. Make the wiring connections: circuit and grounding.
8. Install the switches and dimmers with the mounting hardware.
9. Turn power on.
10. Assure required operation.

COMPETENCY: A-6 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE A-6.3

TASK: Install/connect pilot light.

STANDARD OF PERFORMANCE OF TASK:

Install pilot light so readily visible.
Comes on only when unit is in operation.

SOURCE OF STANDARD: National Electrical Code
V-TECS: House Electrician, 1981, p. 37

CONDITIONS FOR PERFORMANCE OF TASK:

Pilot light
Unit to receive light
Power source
Wiring system
Electrician's basic tool kit
Installation materials

PERFORMANCE GUIDE:

1. Locate appliance or equipment to receive the pilot light.
2. Locate installation point of pilot light.
3. Turn power off.
4. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
5. Read manufacturer's installation instructions.
6. Attach pilot light to appliance or equipment.
7. Run wire of correct size from load side of equipment terminals to the pilot light.
8. connect wire ends of pilot light to wires run from load terminals.
9. Turn power on.
10. Assure required operation.

COMPETENCY: A-6 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE A-6.4

TASK: Install or repair 110 volt light fixtures.

STANDARD OF PERFORMANCE OF TASK:

Light burns when switch is on.
Fixture covers hole with a finished appearance.
Correct polarity.
Installation meets the requirements as outlined by National Electrical Code.

SOURCE OF STANDARD: National Electrical Code, 1984
V-TECS: House Electrician, 1981, p. 32.

CONDITIONS FOR PERFORMANCE OF TASK:

Light fixture
Power source
Wired system
Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Connect fixture wire to power supply observing polarity.
6. Connect ground wire.
7. Attach fixture base to box with screws supplied.
8. Install lamps.
9. Turn power on.

COMPETENCY: A-6 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE A-6.5

TASK: Install/connect flood lights.

STANDARD OF PERFORMANCE OF TASK:

Light burns when switch is on.
Outlet box securely mounted.
Installation meets National Electrical Code.

SOURCE OF STANDARD: National Electrical Code, 1984
V-TECS: House Electrician, 1981, p. 29

CONDITIONS FOR PERFORMANCE OF TASK:

Flood lights
Power source
Wiring system
Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Unfold conductors from box.
5. Remove approximately 3/4's inch insulation from each conductor.
6. Read manufacturer's installation instructions for flood lights.
7. Connect white wires from flood lights to white wires extending from wiring device with approved connectors.
8. Attach black wires of fixture to the switch leg. Complete other circuit connections as required.
9. Connect ground wire to ground terminal.
10. Attach flood light to box using supplied screws.
11. Install lamps.
12. Turn power on.
13. Assure required operation.

COMPETENCY: A-6 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE A-6.6

TASK: Install power failure lighting.

STANDARD OF PERFORMANCE OF TASK:

Wiring entirely independent of all other wiring and equipment.

Power failure lighting operates when electrical power goes off.

Installation meets National Electrical Code standards.

SOURCE OF STANDARD: National Electrical Code
V-TECS: House Electrician, 1981, p. 62

CONDITIONS FOR PERFORMANCE OF TASK:

Structure to wire
Materials for power failure lighting
Electrician's basic tool kit
Installation materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Examine lighting fixture to be sure it is the proper type and size for the application.
6. Examine the mounting boxes and circuit conductors to be sure they are correct.
7. Connect wire ends per manufacturer's installation instructions.
8. Attach fixture to the mounting box.
9. Adjust the position of the lamp.
10. Turn power on.
11. Test according to manufacturer's installation instructions.

COMPETENCY: A-7 Install and maintain motors to meet local code

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PERFORMANCE OBJECTIVE A-7.1

TASK: Reverse the rotation of a motor.

STANDARD OF PERFORMANCE OF TASK:

Direction of rotation of given motor is in opposite direction from previous direction.

SOURCE OF STANDARD:

Articulated, Performance-Based Instruction Objectives Guide for Electricity/Industrial Electricity, Greenville, S.C., 1984, p. 383.

CONDITIONS FOR PERFORMANCE OF TASK:

Given motor and circuit
Electrician's basic tool kit

PERFORMANCE GUIDE:

1. Gain access to the motor starting leads at the terminal, etc.
2. Reverse the two starting windings leads so that the old "S" connection (lead) is on the "R" terminal and the "R" lead is on the "S" terminal.
3. Properly connect the wiring so no hazard exists.
4. Connect the power source and test motor rotation.

COMPETENCY: A-7 Install and maintain motors to meet local code

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PERFORMANCE OBJECTIVE A-7.2

TASK: Change motor for running voltage.

STANDARD OF PERFORMANCE OF TASK:

Motor runs at different voltage than previous voltage. Running speed and current draw are within specifications.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Manufacturer's wiring diagrams
Electrician's basic tool kit
Motor setup for multiple voltage options

PERFORMANCE GUIDE:

1. Identify voltage requirements for data plate or manufacturer's instructions.
2. Perform wiring changes as per instructions.
3. Connections must be mechnaically and electrically secure with no exposed wiring.
4. Check motor for proper rotation and speed.

COMPETENCY: A-7 Install and maintain motors to meet local code

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PERFORMANCE OBJECTIVE A-7.3

TASK: Install and maintain simple motor controls.

STANDARD OF PERFORMANCE OF TASK:

Motor control station causes motor to accelerate through all positions until motor runs at rated speed and current. Where applicable, motor stops and reverses as per control and motor type.

SOURCE OF STANDARD: Writing team

Articulated, Performance-Based Instruction Objectives Guide for Electricity/Industrial Electricity, Greenville, S.C., 1984, p. 415.

CONDITIONS FOR PERFORMANCE OF TASK:

Motor circuit diagram
Functional motor and circuit
Electrician's basic tool kit

PERFORMANCE GUIDE:

1. Review circuit diagram for installation requirements.
2. Disconnect power as applicable.
3. Check location where control station is to be installed.
4. Make mechanical connections as needed.
5. Make electrical connections.
6. Check installation for mechnaical tightness and electrical continuity.
7. Connect power, apply test voltage to machine and check for correct operation.

COMPETENCY: A-7 Install and maintain motors to meet local code

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PERFORMANCE OBJECTIVE A-7.4

TASK: Install and maintain split-phase motor.

STANDARD OF PERFORMANCE OF TASK:

Connected and maintained split phase motor is mechanically and electrically secure, correctly connected to the power source so it operates in correct direction at proper speed.

SOURCE OF STANDARD:

Articulated, Performance-Based Instruction Objectives Guide for Electricity/Industrial Electricity, Greenville, S.C., 1984, p. 381.

CONDITIONS FOR PERFORMANCE OF TASK:

Work order/given circuit
Manufacturer's specifications
Electrician's basic tool kit
Split-phase motor
Wires and connectors as needed, lubricants

PERFORMANCE GUIDE:

1. Disconnect power source.
2. Assemble parts and materials.
3. Connect electrical wiring.
4. Check circuit.
5. Connect power source.
6. Check operation of motor for proper rotation and amperage draw.
7. Maintain by proper lubrication as per manufacturer's instructions.
8. Perform periodic amperage draw checks.
9. Maintain structural integrity of mounting systems, belts, pulleys, gears, etc.
10. Clean soil (dust, etc.) from ventilation provisions of motor as needed.

COMPETENCY: A-7 Install and maintain motors to meet local code

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PERFORMANCE OBJECTIVE A-7.5

TASK: Install and maintain capacitor start motor.

STANDARD OF PERFORMANCE OF TASK:

Connected and maintained capacitor start motor that is mechanically and electrically secure so that motor operates at correct speed and rotation.

SOURCE OF STANDARD:

Articulated, Performance-Based Instruction Objectives Guide for Electricity/Industrial Electricity, Greenville, S.C., 1984, p. 384.

CONDITIONS FOR PERFORMANCE OF TASK:

Work order/given circuit needing capacitor start motor
Electrician's basic tool kit
Capacitor-start motor
Leads and connectors
Lubricants

PERFORMANCE GUIDE:

1. Switch power source off.
2. Assemble parts and materials.
3. Wire the motor correctly to the supply source.
4. Check capacitor wiring if capacitor isolated externally.
5. Switch power source on.
6. Check operation of motor.

COMPETENCY: A-8 Plan and organize work to schedule manpower and materials

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PERFORMANCE OBJECTIVE A-8.1

TASK: Take inventory of materials and tools.

STANDARD OF PERFORMANCE OF TASK:

Inventories shall be taken as per policies and procedures guidelines, in a manner which accounts for all materials and tools assigned to the job, or given area, by quantity and description of like items.

In the absence of guidelines, inventories shall be taken daily, weekly or monthly as job control requirements dictate.

SOURCE OF STANDARD: Writing team

Fundamentals of Construction Management and Organization
Chapter 23 (Tennah, Guevara)

CONDITIONS FOR PERFORMANCE OF TASK:

Inventory list or file
Policies and procedures manual

PERFORMANCE GUIDE:

1. Sort and separate pieces of equipment.
2. Sort and separate materials.
3. Sort and separate supplies.
4. Count and record number of each item of equipment, materials, and supplies.
5. Recount number of each item comparing the second count to the record made of the first.

COMPETENCY: A-8 Plan and organize work to schedule manpower and materials

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PERFORMANCE OBJECTIVE A-8.2

TASK: Maintain time records.

STANDARD OF PERFORMANCE OF TASK:

Records shall be completed daily indicating work hours, job duties and/or assignments, and maintained without computational errors.

SOURCE OF STANDARD: Writing team

Managing Construction Contracts -- Chapter 4 (Collier)

CONDITIONS FOR PERFORMANCE OF TASK:

Timekeeping record forms
Policies and procedures manual

PERFORMANCE GUIDE:

1. Locate all time sheets, cards, etc.
2. Post data on permanent time sheets.
3. Compute total time for pay period.

COMPETENCY: A-8 Plan and organize work to schedule manpower and materials

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PERFORMANCE OBJECTIVE A-8.3

TASK: Make out material list used on each job.

STANDARD OF PERFORMANCE OF TASK:

Materials shall be listed carefully and systematically, similar or associated materials shall be grouped together, and final quantities shall be rechecked.

SOURCE OF STANDARD: Writing team

Estimating Electrical Construction -- Chapters 5, 6 (Cole)

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Materials
National Electrical Code
Calculator
Scale rule

PERFORMANCE GUIDE:

1. Record material used daily, major expense items should be noted when used.
2. Consolidate daily lists into master material used list.
3. Check list against materials ordered to detect items used but not recorded.
4. Compose and submit final list to supervisor.

COMPETENCY: A-8 Plan and organize work to schedule manpower and materials

---

PERFORMANCE OBJECTIVE A-8.4

TASK: Order materials.

STANDARD OF PERFORMANCE OF TASK:

Order forms shall be printed or typed neatly and accurately. Orders shall be processed in a timely manner according to schedule.

SOURCE OF STANDARD: Writing team

Construction Superintending -- Unit 3 (Cole)
Fundamentals of Construction Management -- Chapter 23 (Tennah, Guevara)

CONDITIONS FOR PERFORMANCE OF TASK:

Puchase order forms
Policies and procedures manual
Plans and specifications

PERFORMANCE GUIDE:

1. Obtain plans and specifications.
2. Lists materials by (A) branch circuit materials sechdule, (B) lighting fixture schedule, (C) service and feeder materials schedule.
3. Transfer above information to a format which (A) combines items that are the same, (B) follow industry practices for quantity and description
4. Provide supplier with material lists.

COMPETENCY: A-8 Plan and organize work to schedule manpower and materials

---

PERFORMANCE OBJECTIVE A-8.5

TASK: Complete work orders.

STANDARD OF PERFORMANCE OF TASK:

Work orders shall be completed and authorized prior to commencement of work, and shall correspond to scheduling needs.

Work orders shall be printed or typed neatly.

SOURCE OF STANDARD: Writing team

Construction Superintending -- Chapter 3 (Cole)

CONDITIONS FOR PERFORMANCE OF TASK:

Work order forms
Policies and procedures manual

PERFORMANCE GUIDE:

1. Obtain work order and review.
2. Clarify as necessary with supervisors.
3. Note steps for completion of order.
4. Obtain materials necessary.
5. Obtain tools and equipment necessary.
6. Perform work.
7. Return completed work orders, providing necessary information as required by company policy.

COMPETENCY: A-8 Plan and organize work to schedule manpower and materials

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PERFORMANCE OBJECTIVE A-8.6

TASK: Plan sequence of work operations.

STANDARD OF PERFORMANCE OF TASK:

Work shall be scheduled in the order which it must occur in a desirable, logical, and economical arrangement as determined by the job supervisors.

SOURCE OF STANDARD: Writing team

Construction Superintending -- Chapter 3 (Cole)
Managing Construction Contracts -- Chapter 9 (Collier)

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Scheduling chart

PERFORMANCE GUIDE:

1. Prioritize jobs to be accomplished.
2. Assign employees to jobs consistent with their competencies.
3. Assign employees to jobs according to priority.
4. Assign employees to job according to time required to complete job.
5. Schedule work around use of equipment and facilities.
6. Schedule work around special occasions: i.e., holidays, customer convenience, etc.
7. Revise schedule to insure completion of work by scheduled date.

COMPETENCY: B-1 Install and maintain service entrance to meet local code

---

PERFORMANCE OBJECTIVE B-1.1

TASK: Ground service entrance equipment.

STANDARD OF PERFORMANCE OF TASK:

Connections must be made at designated points, of appropriate methods and connectors and in accordance with local code.

Grounding of service entrance equipment conforms to local code requirements.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 38
Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Ground service entrance equipment

PERFORMANCE GUIDE:

1. Remove meter base cover.
2. Locate all installation points.
3. Apply corrosive inhibitor if required by authority having jurisdiction.
4. Terminate grounding conductor at point designated by the authority having jurisdiction.
5. Drive ground rod or bury grounding electrode
6. Fasten ground wire to grounding electrode with a clamp approved for direct burial.
7. Attach wire to surface of structure.
8. If a metal water system is installed, extend the grounding conductor to the water pipe.

COMPETENCY: B-1 Install and maintain service entrance to meet local code

---

PERFORMANCE OBJECTIVE B-1.2

TASK: Install temporary service entrance.

STANDARD OF PERFORMANCE OF TASK:

Installation must provide voltage and ampacity required.
Branch circuits must have ground fault protection.
Service must be weatherproof if installed outside.
Service must meet requirements of governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 43

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Temporary service entrance -- complete with pole, weatherhead, main service panel, conduit, etc.
Installation/electrical materials

PERFORMANCE GUIDE:

1. Request power supplier to approve the proposed location.
2. Lay pole on ground.
3. Mark off depth pole goes in the ground.
4. Attach meter base five to six feet above ground level.
5. Install raceway or service cable from meter base to top of service pole.
6. Attach raceway to service pole.
7. Install weatherhead.
8. Install raceway between meter base and main service panel.
9. Attach service panel to pole.
10. Install conduit from waterproof receptacle box(es) to service panel.
11. Attach receptacle box to pole.
12. Run all wiring and make wiring connections.
13. Install ground fault protection.
14. Run ground wire and fasten to pole down to ground level.
15. Dig hole for service pole.
16. Install service pole. Tamp dirt back tightly.
17. Drive ground rod or bury grounding electrode.

COMPETENCY: B-1 Install and maintain service entrance to meet local code

---

PERFORMANCE OBJECTIVE B-1.2 continued:

TASK: Install temporary service entrance.

PERFORMANCE GUIDE continued:

18. Fasten ground wire to ground rod or grounding electrode with approved device.
19. Install pole reinforcement as required.
20. Have installation inspected.

COMPETENCY: B-1 Install and maintain service entrance to meet local code

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PERFORMANCE OBJECTIVE B-1.3

TASK: Install mobile home service.

STANDARD OF PERFORMANCE OF TASK:

Service must meet the unit data plate ratings of the mobile home.

Connections must be made at designated points, of appropriate methods and connectors and in accordance with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 43
Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Mobile Home
Mobile home service
Installation/electrical materials

PERFORMANCE GUIDE:

1. Request power company representative to field check site before wiring is begun.
2. Obtain a wiring permit.
3. Erect a creosoted or treated pole as specified by local power service representative.
4. Anchor service pole opposite pull of service drop with approved equipment.
5. Open a trench to a depth to accommodate the installation method.
6. Attach meter base to pole at proper height (5'-6") above finish grade.
7. Install conduit nipple from meter base to waterproof disconnecting means.
8. Attach disconnecting means enclosure to pole.
9. Install conduit bushing on conduit inside meter base.
10. Attach conduit from meter base to top of pole.
11. Strap conduit to pole.
12. Run conductors from meter base to extend at least 16" outside of weatherhead.

COMPETENCY: B-1 Install and maintain service entrance to meet local code

---

PERFORMANCE OBJECTIVE B-1.3

TASK: Install mobile home service.

PERFORMANCE GUIDE continued:

13. Install weatherhead.
14. Drive ground rod or bury grounding electrode.
15. Fasten grounding electrode conductor to grounding electrode.
16. Run conductor from meter base to rain-tight disconnecting means.
17. Install approved raceway from disconnecting means on pole to bottom of ditch for service entrance.
18. Install conduit bushing on conduit if applicable.
19. Install approved raceway from distribution panel in mobile home to bottom of trench.
20. Install conduit bushings if applicable.
21. Run entrance conductors from service pole disconnect to distribution panel in mobile home.
22. Make all wiring connections.
23. Insure that a grounding conductor from grounding terminal of mobile home distribution panel to frame of home is intact.
24. Have service inspected.
25. Fill trench with rock free dirt. If rocks exist, follow local power company rules for coverage.

COMPETENCY: B-1 Install and maintain service entrance to meet local code

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PERFORMANCE OBJECTIVE B-1.4

TASK: Install service entrance cable to service drop.

STANDARD OF PERFORMANCE OF TASK:

Service entrance cable must not be installed on masonry or metallic surfaces.

Must be secured within twelve inches of termination and not exceed intervals of 4.5 feet.

Connections must be made at designated points, of appropriate methods and connectors and in accordance with governing specifications and codes.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Service entrance cable
Installation/electrical materials

PERFORMANCE GUIDE:

1. Remove meter base cover.
2. Attach cable to line side of meter base using approved connectors.
3. Attach cable to surface of structure.
4. Connect cable to line lugs of meter base.
5. Terminate upper end of cable above termination of service drop.
6. Provide sufficient cable to form drip loop.
7. Replace meter base cover.

COMPETENCY: B-1 Install and maintain service entrance to meet local code.

PERFORMANCE OBJECTIVE B-1.5

TASK: Install circuit breakers in panel.

STANDARD OF PERFORMANCE OF TASK:

Breaker must be qualified for panel and must be inserted so that they fully engage the busses and such that the load is equally distributed.

The ampacity rating of the circuit breaker must not exceed that of the circuit conductors.

Installation of circuit breakers must meet requirements of local code.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 39

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Circuit breaker(s)

PERFORMANCE GUIDE:

1. Check breaker size and type to insure that the breaker is suitable for use in panel.
2. Insert breaker in breaker box.
3. Assure continuity with VOM.

COMPETENCY: B-1 Install and maintain service entrance to meet local code

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PERFORMANCE OBJECTIVE B-1.6

TASK: Install main service panel.

STANDARD OF PERFORMANCE OF TASK:

Main service panel and installation must meet the requirements of local code.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 40

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Main service panel with main breaker installed

PERFORMANCE GUIDE:

1. Locate main service panel as near to the point of service entrance as possible.
2. Locate height of main disconnecting means from floor level as required by the National Electrical Code.
3. Remove knockout from main service panel.
4. Mark hole for raceway.
5. Cut hole through storm sheathing 1/2" larger than circle drawn for knockout.
6. Install raceway from point of entrance to main service panel.
7. Attach service panel to structure.

COMPETENCY: B-1 Install and maintain service entrance to meet local code

---

PERFORMANCE OBJECTIVE B-1.7

TASK: Install mast-type service entrance.

STANDARD OF PERFORMANCE OF TASK:

Water must not be able to enter system.
Service mast must be able to support service drop.
Roof clearances, size and type of conduit must conform to governing specifications and codes.
Service entrance conductors must not be shorted or grounded and be of correct size and type according to governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 41

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Roof flange sized to conduit
Weatherhead
Fittings and appropriate fasteners

PERFORMANCE GUIDE:

1. Request power supplier to spot meter base.
2. From meter base, construct a vertical line to the roof overhang.
3. Locate center of hole on soffit board.
4. Bore a hole slightly larger than the conduit through soffit board, decking, and roofing.
5. Install conduit through roof down to meter base.
6. Tighten conduit into hub of meter base.
7. Fasten conduit to wall with rigid conduit straps.
8. Install roof flange around conduit, secure to roof.
9. Run service entrance conductors down to meter base and leave enough of free conductor from top of conduit to meet local requirements.
10. Connect service entrance conductors to line lugs of meter base and tighten securely.
11. Run conductors from load lugs of meter base to disconnect in main service panel.
12. Install weatherhead with one wire per hole in weatherhead.

COMPETENCY: B-1 Install and maintain service entrance to meet local code

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PERFORMANCE OBJECTIVE B-1.7 continued

TASK: Install mast-type service entrance.

PERFORMANCE GUIDE continued:

13. Where conduit enters soffit board, seal with waterproof sealant.
14. Test service entrance conductors for shorts or grounds.

COMPETENCY: B-1 Install and maintain service entrance to meet local code

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PERFORMANCE OBJECTIVE B-1.8

TASK: Install main service disconnect.

STANDARD OF PERFORMANCE OF TASK:

Main service disconnect must be installed so that it simultaneously disconnects all ungrounded service entrance conductors.

Main service disconnect must be qualified for use in the service entrance and must be of the proper amperage.

Connections must be made at designated points, of appropriate methods and connectors and in accordance with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 42

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Main service disconnect

PERFORMANCE GUIDE:

1. Locate installation point for the main service disconnect.
2. Attach the main service disconnect to the building structure.
3. Attach feed cables into main service disconnect.
4. Connect service conductors to the line lugs of the disconnect.
5. Connect load conductors to load lugs of the disconnect.
6. Terminate load conductors at load being served.

COMPETENCY: B-1 Install and maintain service entrance to meet local code

---

PERFORMANCE OBJECTIVE B-1.9

TASK: Install underground service entrance.

STANDARD OF PERFORMANCE OF TASK:

Underground service entrance must meet requirements of governing specifications and codes.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Underground service entrance

PERFORMANCE GUIDE:

1. Request power supplier to spot meter base location.
2. Attach meter base to structure.
3. Open a trench from local power company pole to a point under meter base.
4. Install conduit from meter base to a point near the bottom of the trench.
5. Install plastic bushing on bottom of conduit.
6. Fasten required lengths of conduit together.
7. Prepare required raceway for conductors at pole.
8. Request inspection.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.1

TASK: Make joint using crimp-type connectors.

STANDARD OF PERFORMANCE OF TASK:

Joint must be made using appropriate tool to assure required mechanical strength. Insulation applied to new joint shall meet or exceed the insulation rating of conductor.

Installation must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 10793

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Installation/electrical materials
Crimping tool

PERFORMANCE GUIDE:

1. Remove approximately 3/4's inch of insulation from each conductor.
2. Group conductors together and insert wires into connector.
3. Using correct crimp tool, apply pressure to make connection.
4. Remove crimp tool and cut off excess wire outside crimp.
5. Check each conductor by pulling on it to be sure the joint is mechanically strong.
6. Tape or otherwise insulate connection to withstand applied voltage.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.2

TASK: Make splices using mechnical-type connectors.

STANDARD OF PERFORMANCE OF TASK:

Splice(s) insulated to withstand applied voltage.

Splice(s) made in compliance with the governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 111
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Remove 1/2" to 3/4" insulation from each conductor to be joined.
2. Select the appropriate connectors for the connection(s) to be made.
3. Group conductors together and insert wires into connectors.
4. Tighten connector on conductors.
5. Check each conductor by pulling on it to be sure the joint is mechanically strong.
6. Tape or otherwise insulate connection to withstand applied voltage.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.3

TASK: Make pigtail splice.

STANDARD OF PERFORMANCE OF TASK:

Splice must be mechanically strong and insulated electrically to withstand applied voltage.

Connectors shall be the size appropriate to the wire gauge being connected.

Splices must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 110.

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Remove approximately one inch of insulation from each conductor.
2. Cross the ends.
3. Hold the wires together and twist for 6 or 8 turns.
4. Double ends back with pliers so that insulation will not be punctured.
5. Solder the tip of the splice.
6. Insulate wire with approved means.
7. Tape or otherwise insulate connection to withstand applied voltage.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.4

TASK: Make fixture splice.

STANDARD OF PERFORMANCE OF TASK:

Splice must be mechanically strong and insulated electrically to withstand applied voltage.

Connectors shall be the size appropriate to the wire gauge being connected.

Splice must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 110.

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Determine wiring connection to be made observing polarity.
5. Remove approximately 3/4" of insulation from each conductor.
6. Connect fixture wires to circuit conductors using wire nut or other approved connector.
7. Check connection for mechanical strength by pulling on each conductor.
8. Tape or otherwise insulate connection to withstand applied voltage.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.5

TASK: Rough in line-voltage thermostat wiring.

STANDARD OF PERFORMANCE OF TASK:

Cables must be installed with sufficient length to reach point of connection, in most direct path.

Cable must have sufficient ampacity to serve its intended purpose and must terminate in an approved outlet box.

Rough-in must meet requirements of local governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House electrician, p. 99
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Outlet box for thermostat
Wiring system

PERFORMANCE GUIDE:

1. Run correct size cable from service panel to outlet box.
2. Attach cable to outlet box at thermostat location.
3. Pull cable from thermostat location to location of device being controlled.
4. Strip at least six inches of outer jacket from each cable.
5. Attach cable in outlet boxes using approved connectors.
6. Attach cable to building structure at required intervals.
7. Fold conductors back into box.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.6

TASK: Rough in low-voltage thermostat wiring.

STANDARD OF PERFORMANCE OF TASK:

Cable must be installed with sufficient length to reach point of connection in most direct path.

Cable must have sufficient numbers of wires to control the device being served.

Rough-in must meet requirements of local governing code and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 99
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Thermostat wire

PERFORMANCE GUIDE:

1. Read manufacturer's installation instructions.
2. Locate installation point of thermostat.
3. Run low-voltage wire from the equipment to the make up point of thermostat location.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.7

TASK: Rough in the circuit for door chime system.

STANDARD OF PERFORMANCE OF TASK:

Wire of correct size must be run from each door and the transformer to the point where the chime system will be located.

Sufficient length of wire must be left for future connection of door chime system.

Transformer must be approved for location.

Installation must meet requirements of governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 96

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Wire of specified size

PERFORMANCE GUIDE:

1. Locate installation point.
2. Install a junction box and mount transformer.
3. Run feeder cable to junction box from power source.
4. Run the door bell wire from transformer to chime unit.
5. Run the wire from each push button location to the chime unit location.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.8

TASK: Rough in circuit for intercom system.

STANDARD OF PERFORMANCE OF TASK:

Cable must be installed with sufficient length to reach point of connection in the most direct path.

Cable must have sufficient numbers of wires to control the device being served.

Rough-in must meet local governing codes and specifications, as well as manufacturer's installation requirements.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 97

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Intercom wiring/cable
Rough-in kits (intercom)

PERFORMANCE GUIDE:

1. Read manufacturer's installation instructions.
2. Run a power cable to master station.
3. Attach rough in kits to building structure.
4. Run required size cable(s) from master station to each remote station.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.9

TASK: Rough in non-metallic cable in outlet boxes.

STANDARD OF PERFORMANCE OF TASK:

Cable must be installed with sufficient length to reach point of connection in most direct path.

Cable must be secured so as not to damage insulation.

Cables must be installed according to type of outlet boxes (plastic or metal) being utilizied and must be anchored at the box.

Circuit must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 100
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Non-metallic cable
Outlet boxes

PERFORMANCE GUIDE:

1. Remove one knockout from the outlet box for each cable entering the box.
2. Extend the cable into the outlet box six inches.
   a. If the outlet box is metal, tighten clamp on cable.
   b. If the outlet box is plastic, attach cable to building structure within 8 inches.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.10

TASK: Rough in cable or conduit for branch circuits.

STANDARD OF PERFORMANCE OF TASK:

Installation must be completed without damaging the interior finish.

Cable or conduit must extend from power source to outlet box of load served, be of sufficient length and terminate in approved fittings.

Cable or conduit must be of correct size for load to be served.

Installations of branch circuits must meet requirements of governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 90

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Cable

PERFORMANCE GUIDE:

1. Determine the location for installing the cable or conduit.
2. Remove knockout or provide opening for boxes.
3. Install cable connector or conduit connector.
4. Pull cable for circuit or run conduit for circuit.
5. If conduit, pull conductors through conduit.
6. If metallic conduit, install insulated bushing.
7. Attach cables or raceway to structure as required.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.11

TASK: Rough in a single pole switch circuit.

STANDARD OF PERFORMANCE OF TASK:

Approximately six inches of free wire left for future connections and specifications.

Complies with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House electrician, p. 112
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given previously installed box
Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Locate previously installed box.
2. If power source is to terminate at light switch:
   a. Run cable of correct size and type from power source to device switch location.
   b. Run cable of correct size and type from switch location to device outlet box.
3. If power source is to terminate in fixture/device box:
   a. Run cable of correct size and type from power source to device outlet box.
   b. Run cable of correct size and type from device outlet box to switch location.
4. Strip at least six inches of outer jacket from each cable.
5. Attach cable in outlet boxes using approved connector.
6. Attach cable to building structure at required intervals.
7. Fold conductors back into boxes.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.12

TASK: Run feeder cable from main service panel to auxiliary panel.

STANDARD OF PERFORMANCE OF TASK:

Sufficient cable left at each panel for connections.

Cable run in most direct route and attached to panel boxes with approved connectors.

Complies with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 113
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given previously installed main service and auxiliary panel
Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Remove knockouts from panel boxes.
3. Install cable connector to each panel box.
4. Strip sufficient outer jackets from each cable end.
5. Attach cable to each panel using approved connectors.
6. Attach cable to building structure at required intervals.
7. Fold conductors into panel boxes.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.13

TASK: Make up branch circuit wires to panels.

STANDARD OF PERFORMANCE OF TASK:

Branch circuit wires to panels must comply with governing codes and specifications.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Given a layout of system
Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Determine the location for installing the cable or conduit.
2. Remove knockout or provide opening for boxes.
3. Install cable connector or conduit connector.
4. Pull cable for circuit or run conduit for circuit.
5. If conduit, pull conductors through conduit.
6. If metallic conduit, install insulated bushing.
7. Attach cables or raceway to structure as required.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.14

TASK: Rough in 120 or 240 volt circuits to distribution panel using non-metallic sheathed cable.

STANDARD OF PERFORMANCE OF TASK:

Cable(s) must be installed with sufficient length to reach point of connection in most direct path.

Cable(s) must enter panel through approved connectors.

Circuits must be indentified as to voltage or load served.

Circuits must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House electrician, 1981, p. 87

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Non-metallic sheathed cable

PERFORMANCE GUIDE:

1. Locate installation point.
2. Remove proper size knockout from distribution panel.
3. Attach a non-metallic connector to distribution panel.
4. Pull cable from the outside of distribution panel through the cable connector to opposite side of panel.
5. Tighten clamp on cable. Be careful not to damage insulation.
6. Identfiy circuits as to load served.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.15

TASK: Rough in cable between an existing box and a newly installed box.

STANDARD OF PERFORMANCE OF TASK:

Cable must be installed with sufficient length to reach points of connections.

Cable must be of sufficient ampacity to serve the connected load and must be suitable for the location.

Interior wall finish must not be damaged.

Installation must meet requirements of governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 89

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Cable
Previous wiring

PERFORMANCE GUIDE:

1. Turn power off.
2. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
3. Determine route for the cable to travel.
4. Bore holes for cable as needed.
5. Remove knockout from both boxes.
6. Run cable.
   a. If armored cable, fasten cable to boxes with appropriate connector and install insulated bushing.
   b. If non-metallic cable, run cable into boxes and fasten cable to structure. Be sure to leave approximately six inches of free-standing wire in each box.
7. Turn power on.
8. Assure required operation.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.16

TASK: Rough in cables for single pole switch controlling one or more lights/devices with feed to light/device box.

STANDARD OF PERFORMANCE OF TASK:

Cables must be installed with sufficient length to reach point of connection in the most direct path.

Installation must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 103

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Locate previously installed boxes.
2. Run feeder cable from power source to first light/device box.
3. Run cable from first light/device box to box at switch location.
4. If more than one light/device is to be controlled by this switch, extend cable from first light/device box to second and succeeding outlet boxes.
5. Strip at least six inches of outer jacket from each cable.
6. Attach cable in outlet boxes using approved connectors.
7. Attach cable to building structure at required intervals.
8. Fold conductors back into box.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.17

TASK: Rough-in cables for a single pole switch controlling three lights or devices with a feed to the end light box.

STANDARD OF PERFORMANCE OF TASK:

Cables must be installed with sufficient length to reach point of connection in the most direct path.

Installation must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 104

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Locate previously installed outlet boxes.
2. Run a feed cable from the power source to the last light/fixture device box.
3. Run a three-wire cable form one light device box to the other light box.
4. Repeat step 3 until all light or device boxes are connected together with three-wire cable.
5. Run a two-wire cable to the switch box from the last light or device in a series.
6. Strip at least six inches of outer jacket from each cable.
7. Attach cable in oulet boxes using approved connectors.
8. Attach cable to building structure at required intervals.
9. Fold conductors back into box.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.18

TASK: Rough in a circuit for a split circuit duplex receptacle.

STANDARD OF PERFORMANCE OF TASK:

Cable must be installed with sufficient length to reach point of connection in most direct path.

Installation must meet requirements of governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 105

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Installed receptacle box

PERFORMANCE GUIDE:

1. Locate previously installed wall box.
2. Run three-wire cable from the power source to the wall box.
3. Strip at least six inches of outer jacket form each cable.
4. Attach cable in outlet boxes using approved connectors.
5. Attach cable to building structure at required intervals.
6. Fold conductors back into box.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.19

TASK: Rough in circuit for two 3-way switches controlling one device using conduit and 4" square boxes with plaster rings.

STANDARD OF PERFORMANCE OF TASK:

Plaster ring must be flush with interior wall finish.

Bends in pipe shall not exceed three per pulling box.

Wires must be installed with sufficient length to reach point of connection.

Installation must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 106

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit, including fish tape
Conduit
4" square boxes with plaster rings
Conduit hickey

PERFORMANCE GUIDE:

1. Install four inch boxes with plaster rings.
2. Install conduit between four inch square boxes.
3. Install conduit from one four inch square box to the device box.
4. Attach conduit to all boxes with approved devices.
5. Install conduit bushings if needed.
6. Attach conduit to structure.
7. Pull three wires in conduit between four inch boxes.
8. Pull two wires in conduit between device box and switch box.
9. Fold conductors back into box.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.20

TASK: Rough in direct burial cable.

STANDARD OF PERFORMANCE OF TASK:

Cable must be installed with sufficient length to reach point of connection, and be the correct size and type for direct burial.

Location and depth of cable must meet requirements of local governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 108

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Installation/electrical materials
Plans and specifications
Direct burial cable and bushings

PERFORMANCE GUIDE:

1. Locate installation point.
2. Open trench for cable to depth no less than the minimum requirements of the National Electrical Code and local power system having jurisdiction.
3. Install conduit with required bushings where cable enters and leaves trench.
4. Install cable through conduit and trench leaving extra cable for future connections.
5. Fill trench.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.21

TASK: Install conduit underground.

STANDARD OF PERFORMANCE OF TASK:

Conduit shall be rated acceptable for underground use and installed water tight.

Installation must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 107
Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Installation/electrical materials
Conduit
Conduit bending devices
Excavation equipment

PERFORMANCE GUIDE:

1. Locate installation point.
2. Open trench for conduit to a depth no less than minimum requirements of the National Electrical Code or local power system having jurisdiction.
3. Install conduit in open trench.
4. Install all bushings.
5. Fill trench.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.22

TASK: Rough-in single pole switch controlling one or more lights/devices with feed to a switch box.

STANDARD OF PERFORMANCE OF TASK:

Cable must be installed with sufficient length to reach point of connection in most direct path.

Installation must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 102

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Outlet boxes

PERFORMANCE GUIDE:

1. Locate previously installed boxes.
2. Run cable from power source to box for switch.
3. Run cable from switch box to first light/device outlet box.
4. If more than one light/device is to be controlled by this switch, run cable from first outlet box to second and succeeding outlet boxes.
5. Strip at least six inches of outer jacket from each cable.
6. Attach cable in outlet boxes using approved connectors.
7. Attach cable to building structure at required intervals.
8. Fold conductors back into box.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.23

TASK: Install receptacles with two 3-way switches controlling one half of two receptacles.

STANDARD OF PERFORMANCE OF TASK:

Cables must be installed with sufficient length to reach point of connection in most direct path.

Each three-way switch must control 1/2 of each of the two duplex receptacles.

Sufficient conductors must be installed at each box for the circuit to function.

Installation must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 101
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Locate previously installed boxes.
2. Run a power source into one three-way switch box.
3. Run a three-wire cable of correct size between the three-way switch boxes.
4. Run a two-wire cable form the other receptacle box to one three-way switch box.
5. Run a wire cable between the two receptacle boxes.
6. Strip at least six inches of outer jacket from each cable.
7. Attach cable in outlet boxes using approved connectors.
8. Attach cable to building structure at required intervals.
   CAUTION: The tabs must be removed from the duplex receptacles.
9. Fold conductors back into box.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.24

TASK: Rough in the circuit for a device controlled by two 3-way switches with feed to switch box.

STANDARD OF PERFORMANCE OF TASK:

Cable must be installed with sufficient length to reach points of connection in most direct path.

Power source must terminate at one of the switch outlets.

Cable or circuit must be of correct size for load to be served.

Installation must meet requirements of governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 91
Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Cable

PERFORMANCE GUIDE:

1. Locate previously installed boxes.
2. Run a two-wire cable of proper size to the device being controlled from the remaining switch box.
3. Strip at least six inches of outer jacket from each cable.
4. Attach cable in outlet boxes using approved connectors.
5. Attach cable to building structure at required intervals.
6. Fold conductors back into box.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.25

TASK: Install device controlled by two 3-way switches with feed to the light box.

STANDARD OF PERFORMANCE OF TASK:

Cable must be installed with sufficient length to reach points of connection in most direct path.

Power source must terminate at the three-way switch.

Sufficient conductors must be in each box for circuit to function.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 93
Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Cable

PERFORMANCE GUIDE:

1. Locate previously installed boxes.
2. Run feeder cable of proper size into the device outlet box.
3. Run a three-wire cable of proper size from one switch box to the device outlet box.
4. Run a three-wire cable of proper size from the other switch box to the device outlet box.
5. Strip at least six inches of outer jacket from each cable.
6. Attach cable in outlet boxes using approved connectors.
7. Attach cable to building structure at required intervals.
8. Fold conductors back into box.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.26

TASK: Rough-in for device controlled by two 3-way switches and one 4-way switch with feed to a 3-way switch.

STANDARD OF PERFORMANCE OF TASK:

Cable must be installed with sufficient length to reach points of connection in most direct path.

Power source must terminate at the three-way switch.

Sufficient conductors must be in each box for circuit to function.

Circuit must meet requirements of governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 93.

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Cable

PERFORMANCE GUIDE:

1. Locate previously installed boxes.
2. Run feed or cable of proper size to one of the three-way switch boxes.
3. Run a three-wire cable from the feed switch box to the four-way switch box.
4. Run a three-wire cable from the four-way switch box to the remaining three-way switch box.
5. Run a two-wire cable from the three-way switch box in step 4 to the device being controlled.
6. Strip at least six inches of outer jacket from each cable.
7. Attach cable in outlet boxes using approved connectors.
8. Attach cable to building structure at required intervals.
9. Fold conductors back into box.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.27

TASK: Rough-in for a device controlled by two 3-way switches and one 4-way switch with feed to the light.

STANDARD OF PERFORMANCE OF TASK:

Cable must be installed with sufficient length to reach points of connection in most direct path.

Power source must terminate at the light.

Sufficient conductors must be in each box for circuit to function.

Circuit must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 93
Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Cable

PERFORMANCE GUIDE:

1. Locate previously installed boxes.
2. Run feeder cable into the device outlet box.
3. Run a two-wire cable of proper size from device outlet box to one of the three-way switches.
4. Run a three-wire cable of proper size form one three-way switch box to four-way switch box.
5. Run a three-wire cable of proper size from four-way switch box to other three-way switch box.
6. Strip at least six inches of outer jacket from each cable.
7. Attach cable in outlet boxes using approved connectors.
8. Attach cable to building structure at required intervals.
9. Fold conductors back into box.

COMPETENCY: B-2 Rough in feeders, branch circuit cables, and circuits to meet local code

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PERFORMANCE OBJECTIVE B-2.28

TASK: Rough-in for device controlled by two 3-way switches and two 4-way switches with feed to a 3-way switch.

STANDARD OF PERFORMANCE OF TASK:

Cable must be installed with sufficient length to reach points of connection in most direct path.

Power source must terminate at one of the three-way switches.

Sufficient conductors must be in each box for circuit to function.

Circuit must meet requirements of governing codes and specifications.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 95
Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation/electrical materials
Cable

PERFORMANCE GUIDE:

1. Locate previously installed boxes.
2. Run feeder cable into three-way switch box.
3. Run three-wire cable of proper size from three-way switch box to four-way switch box.
4. Run three-wire cable of proper size from the first four-way switch to the second four-way switch box.
5. Run three-wire cable of proper size from second four-way switch box to the second three-way switch box.
6. Run two-wire cable of proper size from device to the second three-way switch box.
7. Strip at least six inches of outer jacket from each cable.
8. Attach cable in outlet boxes using approved connectors.
9. Attach cable to building structure at required intervals.
10. Fold conductors back into box.

COMPETENCY: B-3 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE B-3.1

TASK: Connect light outlets.

STANDARD OF PERFORMANCE OF TASK:

Outlets securely mounted, with connections tight.

Connections made using methods and connectors suitable for conditions encountered.

Connections meet National Electrical Code standards.

SOURCE OF STANDARD: National Electrical Code
Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Wired system with power source
Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Check governing codes for standards.
2. Locate installation point.
3. Turn power off.
4. Determine that power is off by checking conductor(s) at point of connection(s) with voltage tester.
5. Remove 3/4" insulation from each conductor.
6. Make wiring connection.
7. Fasten ground wire.
8. Attach light(s) to mounting brackets.
9. Turn power on.
10. Assure required operation of light outlets.

COMPETENCY: B-3 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE B-3.2

TASK: Connect incandescent lighting.

STANDARD OF PERFORMANCE OF TASK:

Incandescent lighting located and installed per plan and specifications and operates within predetermined tolerances.

Installation meets National Electrical Code standards.

SOURCE OF STANDARD: Writing team
V-TECS: House Electrician, 1981, p. 30
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Manufacturer's specification
Electrician's basic tool kit
Plans and specifications
Power source
Wiring system
Installation materials
Incandescent lighting

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Connect incandescent lighting, observing polarity.
6. Turn power on.
7. Assure required operation.

COMPETENCY: B-3 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE B-3.3

TASK: Install lighting fixture dimmer.

STANDARD OF PERFORMANCE OF TASK:

Located and installed, with connections tight.
Operates within predetermined tolerances.
Meets National Electrical Code standards.

SOURCE OF STANDARD: National Electrical Code
V-TECS: House Electrician, 1981, p. 30

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Manufacturer's specifications
Electrician's basic tool kit
Light dimmer system
Installation/electrical materials
Power source
Wired system

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Examine the dimmer to be sure it is the proper type and size for the application (flourescent or incandescent).
6. Examine the mounting boxes and circuit conductors to be sure they are corret.
7. Make the wiring connections: circuit and grounding.
8. Install the switches and dimmers with the mounting hardware.
9. Turn power on.
10. Assure required operation.

COMPETENCY: B-3 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE B-3.4

TASK: Install moisture resistant fixtures.

STANDARD OF PERFORMANCE OF TASK:

Fixture in desired location, with all gaskets, globes and/or seals installed so fixture is moisture resistant.

Fixture controlled by approved means.

Meets National Electrical Code standards.

SOURCE OF STANDARD: National Electrical Code
V-TECS: House Electrician, 1981, p. 36

CONDITIONS FOR PERFORMANCE OF TASK:

Given moisture resistant fixture
Power source
Wired system
Electrician's basic tool kit
Installation materials

PERFORMANCE GUIDE:

A.
1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Install box or fixture housing per manufacturer's installation instructions.
6. Make wiring connections observing polarity.
7. Attach lamp assembly to housing or outlet box. Make certain that all gaskets and seals are in place.
8. Turn power on.
9. Assure required operation.

B.
1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductors at point of connections with voltage tester.
4. Read manufacturer's installation instructions.

COMPETENCY: B-3 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE B-3.4 continued

TASK: Install moisture resistant fixtures.

PERFORMANCE GUIDE continued:

B. (continued):

5. Remove insulation from each conductor to length suggested by manufacturer.
6. Connect white wire to silver colored terminal.
7. Connect black wire to gold or brown colored terminal.
8. Connect grounding conductor to green colored terminal.
9. Attach receptacle to receptacle housing. Be sure gaskets or other water proofing materials are in place.
10. Install protective covers or cover plates.
11. Turn power on.
12. Check for correct polarity.

COMPETENCY: B-3 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE B-3.5

TASK: Install fluorescent lighting fixture.

STANDARD OF PERFORMANCE OF TASK:

Light works when switch on.
Installation meets National Electrical Code standards.
Fixture cover hole and presents a finished appearance.

SOURCE OF STANDARD: National Electrical Code
V-TECS: House Electrician, 1981, p. 32

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Given fluorescent light fixture
Power source
Wired system
Installation materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Measure clearances to meet manufacturer's recommendations.
3. Cut holes of correct size in ceiling at desired location.
4. Attach fixture housing to the structure per manufacturer's installation instructions.

COMPETENCY: B-3 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE B-3.6

TASK: Install post lights.

STANDARD OF PERFORMANCE OF TASK:

Light post securely anchored, with light controlled by approved means.

Installation meets National Electrical Code standards.

SOURCE OF STANDARD: National Electrical Code
V-TECS: House Electrician, 1981, p. 34

CONDITIONS FOR PERFORMANCE OF TASK:

Given post lights
Power source
Previously roughed in wiring
Manufacturer's specification
Electrician's basic tool kit
Plans and specifications

PERFORMANCE GUIDE:

1. Locate installation point.
2. Be sure post is well achored.
3. Turn power off.
4. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
5. Read manufacturer's installation instructions.
6. Connect post light wire ends to power source observing polarity.
7. Connect ground wire.
8. Attach fixture to post.
9. Install lamps.
10. Turn power on.
11. Assure required operation of light.

COMPETENCY: B-3 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE B-3.7

TASK: Install fan controlled by switch.

STANDARD OF PERFORMANCE OF TASK:

Connections made using methods and connectors suitable for conditions encountered and local authority having jurisdiction.

Switch works fan.

Meets National Electrical Code standards.

SOURCE OF STANDARD: National Electrical Code, 1984
V-TECS: House Electrician, 1981, p. 28

CONDITIONS FOR PERFORMANCE OF TASK:

Manufacturer's specification
Electrician's basic tool kit
Plans and specifications
Fan
Power source
Installation materials
Wiring System

PERFORMANCE GUIDE:

A. Install/connect fan controlled by switch

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Remove approximately 3/4's inch insulation from each conductor.
6. Make wiring connections.
7. Fasten ground wire.
8. Attach fan to mounting brackets.
9. Turn power on.
10. Check fan for correct operation.
11. Assure required current drain.

COMPETENCY: B-3 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE B-3.7 continued

TASK: Install fan controlled by switch.

PERFORMANCE GUIDE continued:

B. Install/connect heat-a-vent light:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Install the housing per instructions.
6. Attach previously run wire from power source to the housing using a cable clamp and the appropriate knockout.
7. Remove approximately 3/4's inch of insulation from each conductor.
8. Identify all coductors.
9. Make all wiring connections observing polarity.
10. Connect the ground wire.
11. Install cover plates on junction boxes to cover exposed wiring.
12. Install trim.
13. Turn power on.
14. Assure required operation.

COMPETENCY: B-3 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE B-3.8

TASK: Determine and install: single pole light circuits, 3-way light switches and 4-way switches.

STANDARD OF PERFORMANCE OF TASK:

Light device located and installed per plans and specifications, with light controlled from either switch locations.

Cover plate straight, covers opening, and fits flush to wall.

Installation per National Electrical Code standards.

SOURCE OF STANDARD: National Electrical Code

Articulated, Performance-Based Instruction Objectives Guide for Electricity/Industrial Electricity, Greenville, S.C., 1984, p. 297.

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Necessary switches and materials
Wired system with power source
Given a situation where single pole light switch, 3-way, and 4-way light switches required

PERFORMANCE GUIDE:

1. Locate installation point.
2. Check governing electrical standards.
3. Turn power off.
4. Determine that power is off by checking conductor(s) at point of connector(s) with voltage tester.
5. Read manufacturer's installation instructions.
6. Connect wiring to remote-control device with connector(s) suitable for conditions encountered.
7. Attach remote-control unit to wall or provided location.
8. Turn power on.
9. Assure required operation.

PERFORMANCE OBJECTIVE B-3.9

TASK: Install power failure lighting.

STANDARD OF PERFORMANCE OF TASK:

Emergency (power failure) lighting wiring kept entirely independent of all other wiring and equipment.

Emergency lights must operate automatically when electrical power goes off.

Installed per National Electrical Code.

SOURCE OF STANDARD: National Electrical Code

Articulated, Performance-Based Instruction Objectives Guide for Electricity/Industrial Electricity, Greenville, S.C., 1984, p. 297.

CONDITIONS FOR PERFORMANCE OF TASK:

Diagram for emergency lighting system
Wired system with power source
Manufacturer's specification
Electrician's basic tool kit
Plans and specifications
Installation materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Examine lighting fixture to be sure it is the proper type and size for the application.
6. Examine the mounting boxes and circuit conductors to be sure they are correct.
7. Connect wire ends per manufacturer's installation instructions.
8. Attach fixture to the mounting box.
9. Adjust the position of the lamp.
10. Turn power on.
11. Test according to manufacturer's installation instructions.

COMPETENCY: B-3 Install lighting fixtures to meet local code

PERFORMANCE OBJECTIVE B-3.10

TASK: Install remote-control circuits.

STANDARD OF PERFORMANCE OF TASK:

Light burns at dusk -- turns off at dawn, or when conditions are simulated.

Installation meets National Electrical Code standards.

SOURCE OF STANDARD: National Electrical Code
V-TECS: House Electrician, 1981, p. 33

CONDITIONS FOR PERFORMANCE OF TASK:

Given photoelectric control
Wired system with power source
Electrician's basic tool kit
Installation materials
Manufacturer's specifications

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Examine lighting fixture to be sure it is the proper type and size for the application.
6. Examine the mounting boxes and circuit conductors to be sure they are correct.
7. Connect wire ends per manufacturer's installation instructions.
8. Attach fixture to the mounting box.
9. Adjust the postition of the lamp.
10. Turn power on.
11. Test according to manufacturer's installation instructions.

COMPETENCY: B-4 Install switch boxes and outlet boxes to meet local code

---

PERFORMANCE OBJECTIVE B-4.1

TASK: Install flush mount junction box.

STANDARD OF PERFORMANCE OF TASK:

Junction box flush with finished surface, located and installed per plans and specifications.

Installation meets National Electrical Code.

SOURCE OF STANDARD: V-TECS: House Electrican, 1981, p. 49
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given a flush mount junction box
Plans and specifications
Electrician's basic tool kit
Installation materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Determine the thickness of the finished surface.
3. Position flush mount junction box.
4. Attach to structure so that the box will be flush with the finished surface and secure.

COMPETENCY: B-4 Install switch boxes and outlet boxes to meet local code

---

PERFORMANCE OBJECTIVE B-4.2

TASK: Install flush mount switch and outlet box in drywall.

STANDARD OF PERFORMANCE OF TASK:

Switch box and/or outlet box complies with governing specifications and code requirements.

Securely mounted and flush with finished surface, with box located per plans.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 50
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given switch box and/or outlet box
Plans and specifications
Electrician's basic tool kit
Installation materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Determine the thickness of the finished surface.
3. Position switch box and/or outlet box.
4. Attach to structure so that the box will be flush with the finished surface.

COMPETENCY: B-4 Install switch boxes and outlet boxes to meet local code

---

PERFORMANCE OBJECTIVE B-4.3

TASK: Install octagon outlet box.

STANDARD OF PERFORMANCE OF TASK:

Outlet box mounted securely and located per plans.
Complies with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 53
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given octagon outlet box
Plans and specifications
Electrician's basic tool kit
Installation materials

PERFORMANCE GUIDE:

1. Locate installation point on structure.
2. Attach octagon outlet box to structure according to electrical plans.

COMPETENCY: B-4 Install switch boxes and outlet boxes to meet local code

---

PERFORMANCE OBJECTIVE B-4.4

TASK: Install surface mount junction box.

STANDARD OF PERFORMANCE OF TASK:

Box securely mounted and according to plans.

Installation of surface mounted junction box complies with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 56
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given junction box
Plans and specifications
Electrician's basic tool kit
Installation materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Locate junction box so it is accessible.
3. Attach junction box to structure such that it will be flush with the finished surface.

COMPETENCY: B-4 Install switch boxes and outlet boxes to meet local code

---

PERFORMANCE OBJECTIVE B-4.5

TASK: Install flush mount switch and outlet box in a masonry wall.

STANDARD OF PERFORMANCE OF TASK:

Boxes recessed no more than 1/8" from finished surface.

Boxes securely anchored (permanently) correct sizes and level across top.

Complies with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 51
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Plans and specifications
Electrician's basic tool kit
Installation materials
Given switch box and/or outlet box

PERFORMANCE GUIDE:

1. Locate installation point.
2. Attach previously roughed in cable or conduit to box.
3. Position box in the wall.
4. Anchor box in wall.

COMPETENCY: B-4 Install switch boxes and outlet boxes to meet local code

---

PERFORMANCE OBJECTIVE B-4.6

TASK: Install flush mount switch box and outlet in a paneled wall.

STANDARD OF PERFORMANCE OF TASK:

Switch box and/or outlet box complies with governing specifications and code requirements.

Securely mounted and flush with finished surface, with box located per plans.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 50
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given switch box and/or outlet box
Plans and specifications
Electrician's basic tool kit
Installation materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Determine the thickness of the finished surface.
3. Position flush mount junction box.
4. Attach to structure so that the box will be flush with the finished surface.

COMPETENCY: B-4 Install switch boxes and outlet boxes to meet local code

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PERFORMANCE OBJECTIVE B-4.7

TASK: Install hangable boxes.

STANDARD OF PERFORMANCE OF TASK:

Hangable boxes required size and type.
Boxes securely fastened and level across top.
Complies with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 52
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given gangable boxes
Plans and specifications
Electrician's basic tool kit
Installation materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Determine number of boxes needed.
3. Fasten boxes together.
4. Attach boxes to structure as to be flush with finished surface.

COMPETENCY: B-4 Install switch boxes and outlet boxes to meet local code

---

PERFORMANCE OBJECTIVE B-4.8

TASK: Install (bar-hanger) mounted box.

STANDARD OF PERFORMANCE OF TASK:

Box securely mounted flush with finished ceiling and located per plans.

Installation meets National Electrical Code.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 48
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given box
Plans and specifications
Electrician's basic tool kit
Installation materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Attach bar to joist such that box will be flush with the finished ceiling.

COMPETENCY: B-4 Install switch boxes and outlet boxes to meet local code

---

PERFORMANCE OBJECTIVE B-4.9

TASK: Install boxes in existing wall.

STANDARD OF PERFORMANCE OF TASK:

Boxes of required size and type, level across the top and located per plan.

Complies with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 54
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given wall boxes
Wired system with power source
Plans and specifications
Electrician's basic tool kit
Installation materials

PERFORMANCE GUIDE:

1. Locate installation point.
2. Draw outline of box on wall near stud, if possible.
3. Cut holes in existing wall of size to accept box to be installed or remove paneling or wall board.
4. Attach and level box to structure.

COMPETENCY: B-5 Install environmental control components to meet local code

---

PERFORMANCE OBJECTIVE B-5.1

TASK: Install/connect vent fans.

STANDARD OF PERFORMANCE OF TASK:

All connections must be made using methods and connectors appropriate for conditions encountered and in accordance with local code.

Switch must turn vent fan off when in off position and on when in on position.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 28

CONDITIONS FOR PERFORMANCE OF TASK:

Manufacturer's specification
Electrician's basic tool kit
Plans and specifications
Wiring system with power source
Installation/electrical materials
Vent fan

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Remove approximately 3/4" insulation from each conductor.
6. Make wiring connections.
7. Fasten ground wire.
8. Attach fan to mounting brackets.
9. Turn power on.
10. Check fan for correct operation.
11. Assure required current draw.

COMPETENCY: B-5 Install environmental control components to meet local code

---

PERFORMANCE OBJECTIVE B-5.2

TASK: Install/connect control devices.

STANDARD OF PERFORMANCE OF TASK:

All connections must be made using methods and connectors appropriate for conditions encountered and in accordance with local codes.

Control devices must be of type and rating designated by unit data plate.

Equipment and system controlled must operate as per manufacturers specifications.

SOURCE OF STANDARD: Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Manufacturer's specification
Electrician's basic tool kit
Plans and specifications
Installation/electrical materials
Control device

PERFORMANCE GUIDE:

A
1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Connect wiring to humidity control device with connector suitable for conditions encountered. Be sure connections are tight.
6. Attach humidity control device to wall or to return air duct system depending on type of device being used.
7. Turn power on.
8. Assure required operation.

COMPETENCY: B-5 Install environmental control components to meet local code

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PERFORMANCE OBJECTIVE B-5.2 continued:

TASK: Install/connect control devices.

PERFORMANCE GUIDE continued:

B
1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at points of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Connect power leads of low-voltage control devices to light fixture wiring using suitable connectors.
6. Connect low-voltage control lead to relays and control switches as required to complete the wiring of the low-voltage lighting control using suitable connector.
7. Turn power on.
8. Check for operation of control system.

C
1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Attach photo-electric cell to outlet box or light fixture as appropriate.
6. Make wiring connections per manufacturer's instruction using suitable connectors.
7. Install cover plates or rehang fixture.
8. Turn power on.
9. Assure required operation.

COMPETENCY: B-5 Install environmental control components to meet local code

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PERFORMANCE OBJECTIVE B-5.3

TASK: Install/connect line voltage thermostat.

STANDARD OF PERFORMANCE OF TASK:

Thermostat control unit is attached as evidenced by cycling on and off at its set point.

Thermostat has amperage rating equal to or higher than the connecting load.

Thermostat is mounted level and plumb.

Connections must be made using methods and connectors appropriate for conditions encountered and in accordance with local code.

SOURCE OF STANDARD: V-TECS: House Electrican, pg. 24
Writing team

CONDITIONS FOR PERFORMANCE OF TASK:

Manufacturer's specification
Electrician's basic tool kit
Plans and specifications
Previously roughed in wiring with power source
Installation/electrical materials
Line voltage thermostat

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Attach supply cable or conduit to box for thermostat.
6. Identify conductors.
7. Connect supply conductors to line terminals of thermostat.
8. Connect load conductors to load side of thermostat.
9. Attach thermostat to box provided for it.
10. Turn power on.
11. Set thermostat to the desired temperature.
12. Observe operation through at least one cycle.
13. Turn power off or leave thermostat set for normal operation of equipment as per instruction of owner.

COMPETENCY: B-5 Install environmental control components to meet local code

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PERFORMANCE OBJECTIVE B-5.4

TASK: Install/connect low voltage thermostat.

STANDARD OF PERFORMANCE OF TASK:

1. Connections must be made using methods and connectors appropriate for conditions encourntered and in accordance with local code.
2. Thermostat is mounted level and plumb.
3. Heat anticipator adjustment is set to match current rating of device being controlled.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 25

CONDITIONS FOR PERFORMANCE OF TASK:

Manufacturer's specification
Electrician's basic tool kit
Plans and specifications
Previously roughed in wiring with power source
Installation/electrical materials
Low voltage thermostat

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine power is off by checking conductor(s) at point of connections(s) with voltage tester.
4. Remove thermostat from shipping carton.
5. Read manufacturer's installation instructions.
6. Remove approximately 3/4" insulation from each conductor.
7. Connect conductors to thermostat using methods and connectors suitable for conditions encountered, also observing color coding of wiring.
8. Attach thermostat to structure or designated point on equipment.
9. Determine that thermostat has been installed level and plumb.
10. Set heat anticipator adjustment to match current rating of device being controlled.
11. Install all trim and cover plates.
12. Turn power on.
13. Assure required operation.

COMPETENCY: B-5 Install environmental control components to meet local code

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PERFORMANCE OBJECTIVE B-5.5

TASK: Install/connect heating and cooling equipment.

STANDARD OF PERFORMANCE OF TASK:

Disconnecting means must be type and rating designated by unit data plate.

All connections must be made using methods and connectors appropriate for conditions encountered and in accordance with local code.

Equipment/system must operate as per manufacturers specifications.

SOURCE OF STANDARD: Writing team
V-TECS: House Electrician, 1981, pg. 21

CONDITIONS FOR PERFORMANCE OF TASK:

Manufacturer's specification
Electrician's basic tool kit
Plans and specifications
Wiring system with power source
Heating and/or cooling equipment
Installation/electrical materials

PERFORMANCE GUIDE:

A Connect/Install Baseboard Heat Unit

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read the manufacturer's installation instructions.
5. Remove heat unit from housing, if required.
6. Attach wiring to housing.
7. Place temporary spacer approximately one inch thick under each end of heater to allow for later installation of floor covering.
8. Attach housing to wall. Use a level to verify that unit is level.
9. Remove spacer.
10. Replace heat unit in housing, if unit was removed.
11. Identify conductors, make connections including equipment ground.

COMPETENCY: B-5 Install environmental control components to meet local code

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PERFORMANCE OBJECTIVE B-5.5 continued:

TASK: Install/connect heating and cooling equipment.

PERFORMANCE GUIDE continued:

A (continued):

12. Check circuit to see if it is free of grounds using an ohmmeter.
13. Install junction box cover and all trim hardware.
14. Turn power on.
15. Assure required current draw using an ammeter.

B Connect central Electric Heat

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions and unit data plate.
5. Identify conductors.
6. Connect cable for supply conductors to disconnect switches.
7. Connect supply conductors to line side of disconnect switch.
8. Run conduit from disconnect switch to heat unit.
9. Pull conductor of correct size and type through conduit from disconnect switch to heat unit control box.
10. Connect conductor to terminals provided inside of heat unit.
11. Connect equipment grounding conductor.
12. Connect wiring from thermostat control cable to terminals provided in electric heat unit.
13. Install cover plates on junction boxes to cover exposed wiring.
14. Check connections for shorts and grounds with ohmmeter. (Operation is usually checked by heating and air contractor.) **Caution:** Make sure power source is disconnected when using ohmmeter.

C Connect Furnace Motor

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.

COMPETENCY: B-5 Install environmental control components to meet local code

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PERFORMANCE OBJECTIVE B-5.5 continued:

TASK: Install/connect heating and cooling equipment.

PERFORMANCE GUIDE continued:

C (continued):

4. Read manufacturer's installation instructions.
5. Identify conductors and determine connections for voltage supplied.
6. Attach power cable or conduit to motor controller.
7. Connect supply conductor to terminals provided on motor controller.
8. Run conduit, cable, or wire from motor controller to furnace motor.
9. Connect conductors at motor and at motor controller using approved connectors.
10. Install cover plates on junction boxes to cover exposed wiring.
11. Turn power on.
12. Turn motor controller on.
13. Check motor rotation.
14. Check motor amps with ammeter. Amperage must be within limits set on motor data plate.

D Connect Ceiling Heat Cable to Thermostat

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Pull ends of heat cable out of wall box for thermostat.
6. Determine wattage (size) of heat cable by looking at label near end of cable.
7. Connect cable leads and power leads to thermostat.
8. Turn circuit on and using clamp on type ammeter, verify that circuit is drawing correct amount of power.
9. Complete installation of thermostat to wall box.

E Connect/Install Wall Heater

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Remove heating coils from housing.

COMPETENCY: B-5 Install environmental control components to meet local code

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PERFORMANCE OBJECTIVE B-5.5 continued:

TASK: Install/connect heating and cooling equipment.

PERFORMANCE GUIDE continued:

E (continued):

6. Attach cable to housing.
7. Attach housing to structure.
8. Identify conductors.
9. Remove only sufficient insulation to accept connector.
10. Connect heater leads to power source.
11. Connect ground to grounding terminal.
12. Install heater in housing.
13. Install trim.
14. Turn power on.
15. Observe heater coils to see if they turn red or test heater performance with ammeter.

F <u>Ceiling Heat Cable</u>

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read and be familiar with the requirements of Article 424 of the National Electrical Code.
5. Read manufacturer's installation instructions.
6. Determine from manufacturer's instructions or electrical floor plan that the cable supplied is the correct size for the rooms to be heated.
7. Determine the space (at least 1 1/2") between cable runs.
8. Attach cable only to gypsum board, plaster lath, or other similar fire resistant nonconductive materials. Cable is to be strapped or otherwise secured a minimum of every 16 inches.
9. Run feeder cable from thermostat location through wall and/or floor partition back to distribution panel.
10. When all of cable has been attached to ceiling, notify authority having jurisdiction that installation is ready for inspection.

G
1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.

COMPETENCY: B-5 Install environmental control components to meet local code

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PERFORMANCE OBJECTIVE B-5.5 continued:

TASK: Install/connect heating and cooling equipment.

PERFORMANCE GUIDE continued:

G (continued):

4. Read manufacturer's installation instructions.
5. Identify conductors.
6. Attach supply conductor cable or conduit to local unit disconnect switch.
7. Connect supply conductors to terminals provided in local disconnect switch.
8. Run appropriate conduit, wire, cable, etc., from local disconnect switch to gas heat unit.
9. Make wiring connections at local unit disconnect switch and at heat unit using ohmmeter. Check wiring to see if it is clear of grounds and shorts.
10. Make wiring connections required for thermostat control of unit.
11. Turn fuel valve off on heating unit.
12. Turn power on for heating unit.
13. Follow unit directions for lighting pilot light.
14. After amount of time specified by manufacturer, turn fuel valve on for heat unit.
15. Set thermostat to bring heat on.
16. Let the unit run for a few minutes.
17. Set thermostat to below normal setting.
18. Unit should cut off.
19. Install cover plates on junction boxes to cover exposed wiring.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

---

PERFORMANCE OBJECTIVE B-6.1

TASK: Connect convenience outlets.

STANDARD OF PERFORMANCE OF TASK:

Connection of wiring to receptacle shall be done in accordance to governing specifications and code requirements.

Outlet to demonstrate proper polarity and grounding, and must be mounted in a manner to present a uniform appearance.

SOURCE OF STANDARD: Writing team

V-TECS: House electrician, 1981, p. 117
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Installation/electrical materials
Wiring system with power source
Duplex receptacle

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn off power.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Cut conductor at wall box to leave six inches of free conductor.
5. Remove approximately 3/4's inch of insulation from each conductor.
6. Connect white conductors to silver or white terminals.
7. Connect black conductor to brass or gold colored terminals.
8. If there are two or more grounding conductors, they must be securely connected together using an approved means and fastened to receptacle and to box if required.
9. If box is metal, connect grounding conductors to green terminals and to wall box.
10. Fasten outlet to wall box.
11. Install cover plate.
12. Turn power on.
13. Test for correct polarity.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

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PERFORMANCE OBJECTIVE B-6.2

TASK: Connect duplex receptacles.

STANDARD OF PERFORMANCE OF TASK:

Connection of wiring to receptacles shall be done in accordance to governing specifications and code requirements.

Outlets demonstrate proper polarity and grounding and must be maintained in a manner to present a uniform appearance.

SOURCE OF STANDARD: Writing Team
V-TECS: House Electrician, 1981
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Installation/electrical materials
Wiring system with power source
2 duplex receptacles

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn off power.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Cut conductor at wall box to leave six inches of free conductor.
5. Remove approximately 3/4's inch of insulation from each conductor.
6. Connect white conductors to silver or white terminals.
7. Connect black conductor to brass or gold colored terminals.
8. If there are two or more grounding conductors, they must be securely connected together using an approved means and fastened to receptacle and to box if required.
9. If box is metal, connect grounding conductors to green terminals and to wall box.
10. Fasten outlet to wall box.
11. Install cover plate.
12. Turn power on.
13. Test for correct polarity.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

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PERFORMANCE OBJECTIVE B-6.3

TASK: Connect four wire 220 volt receptacles.

STANDARD OF PERFORMANCE OF TASK:

Connection of wiring to receptacle shall be done in accordance to governing specifications and code requirements.

Outlet to demonstrate proper polarity and grounding, and must be mounted in a manner to present a uniform appearance.

SOURCE OF STANDARD: Writing Team

V-TECS: House Electrican, 1981, p. 120
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Installation/electrical materials
220 volt receptacle
Wiring system with power source

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Cut conductors at wall box to leave six inches of free conductor.
6. Remove approximately 3/4's inch insulation from each conductor.
7. Connect grounding conductor (green to bare) to grounding terminal.
8. Connect one-line conductor to one of brass or gold colored terminal.
9. Connect remaining line conductor.
10. Connect white conductor to identified neutral terminal.
11. Attach receptacle to wall box.
12. Install cover plate.
13. Turn power on.
14. Check for required polarity.
15. Check for required voltage.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

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PERFORMANCE OBJECTIVE B-6.4

TASK: Connect emergency warning system (burglar or fire).

STANDARD OF PERFORMANCE OF TASK:

System will give a warning signal if monitoring points are activated.

Emergency systems shall be installed in accordance to governing specification and code requirements.

SOURCE OF STANDARD: V-TECS: House Electrician

Mechanical and Electrical Equipment For Buildings, Part Seven (McGuinnese, Stein, Reynold)

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Installation/electrical materials
Wiring system with power source
Layout points to be monitored

PERFORMANCE GUIDE:

1. From layout of system, determine location of master control unit and points to be monitored.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Run low voltage wiring from each point to be monitored back to central location of master unit.
6. Install window foil, window switch, door switch, mat switches, smoke detector, fire detector, etc., in each room to be monitored.
7. Run 110 volt wiring circuit from main service panel to alarm system and control station.
8. Check rough in wiring for shorts and open circuits.
9. Connect detectors.
10. Connect master control unit.
11. Turn power on.
12. Assure required operation of system by activating each detector.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

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PERFORMANCE OBJECTIVE B-6.5

TASK: Connect hot water heater.

STANDARD OF PERFORMANCE OF TASK:

Voltage must meet water heater requirements.

Connections must be made in accordance to governing specification and code requirements.

SOURCE OF STANDARD: V-TECS: House Electrician, p. 123

National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Water heater with plumbing connections made
Electrician's basic tool kit
Installation/electrical materials
Wiring system with power source

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Install cable connector or conduit connector in junction box on water heater.
5. Connect cable or conduit to water heater.
6. Remove approximately 3/4's inch insulation from each conductor.
7. Connect wiring using method and materials suitable for conditons encountered.
8. Read water heater nameplate.
9. Determine that correct voltage is available at water heater.
10. Check to see that tank is full of water.
11. Turn power on.
12. Check power consumption using clamp-on ampmeter.
13. Install cover plate.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

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PERFORMANCE OBJECTIVE B-6.6

TASK: Connect three wire 220 volt receptacle.

STANDARD OF PERFORMANCE OF TASK:

Connection of wiring to receptacle shall be done in accordance to governing specifications and code requirements.

Outlet to demonstrate proper polarity and grounding, and must be mounted in a manner to present a uniform appearance.

SOURCE OF STANDARD: Writing Team

V-TECS: House Electrican, 1981, p. 120
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Installation/electrical materials
220 volt receptacle
Wiring system with power source

PERFORMANCE GUIDE:

1. Review plans, specifications.
2. Locate installation point.
3. Assemble tools and materials.
4. Turn power off.
5. Verify that power is off.
6. Cut conductor at wall, leave 6" of free conductor.
7. Remove 3/4" of insulation from each conductor.
8. Connect grounding conductor (green or bare) to proper grounding terminal.
9. Connect one of the line conductors to the brass (gold) terminal.
10. Connect remaining line conductor to other brass (gold) terminal.
11. Attach receptable to wall box.
12. Install cover.
13. Turn power on.
14. Check for proper voltage and polarity.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

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PERFORMANCE OBJECTIVE B-6.7

TASK: Connect ground fault interrupting device.

STANDARD OF PERFORMANCE OF TASK:

Installation of interrupting device shall be done in accordance to governing specifications and code requirements.

Installed devices must be mounted in a manner to present a uniform appearance, demonstrate proper polarity, and be tested for operation.

SOURCE OF STANDARD: Writing team

V-TECS: House Electrician, 1981, p. 121
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Installation/electrical materials
Wiring system with power source
Ground fault interrupting device (i.e., receptacle, circuit breakers)

PERFORMANCE GUIDE:

A.
1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Determine that power has been turned off by checking each conductor with voltage tester.
6. Cut conductor at wall box to leave six inches of free conductor.
7. Remove approximately 3/4's inch insulation from each conductor.
8. Connect grounding conductor (green to bare) to grounding terminal.
9. Connect one-line conductor to one of brass or gold colored terminal.
10. Connect remaining line conductor to other brass or gold colored terminal.
11. Attach receptacle to wall box.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

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PERFORMANCE OBJECTIVE B-6.7 continued:

TASK: Connect ground fault interrupting device.

PERFORMANCE GUIDE continued:

A. (continued):

12. Install cover plate.
13. Turn power on.
14. Check for correct polarity and voltage.

B.
1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. If circuit breaker-type device, snap or bolt breaker in a breaker panel.
6. Locate circuit conductors to be protected for ground fault interrupting device.
7. Remove approximately 3/4's inch insulation form each conductor.
8. Connect grounding conductor to ground bar in breaker panel.
9. Connect white or neutral conductor to identified terminal of circuit breaker.
10. Connect free end of coiled white neutral conductor of lead attached to circuit breaker to neutral bar in breaker panel.
11. Connect black or circuit conductor to load terminal of circuit breaker.
12. If ground fault interrupting is of ground fault interrupting receptacle type, determine outlet box ground fault interrupting receptacle type device is to be mounted in.
    a. Fold wire end out of wall box.
    b. Remove approximately 3/4's inch insulation from each conductor.
    c. Connect green or bare conductor to grounding terminal on ground fault interrupting device and to wall box if it is of metal.
    d. Connect white wire to silver colored terminal of receptacle.
    e. Connect black wire to brass or gold colored terminal.
    f. Attach ground fault interrupting device to wall box.
    g. Attach cover plate.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

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PERFORMANCE OBJECTIVE B-6.7 continued:

TASK: Connect ground fault interrupting device.

PERFORMANCE GUIDE continued:

B. (continued):

13. Turn power on.
14. Test unit for correct operation as per manufacturer's instructions.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

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PERFORMANCE OBJECTIVE B-6.8

TASK: Connect wires from junction box to appliance.

STANDARD OF PERFORMANCE OF TASK:

Wiring to be connected using manufacturer's requirements and governing specification and code requirements.

Polarity and grounding must be correct.

SOURCE OF STANDARD: Writing Team

V-TECS: House Electrican, 1981, p. 120
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Appliance to be connected
Junction Box
Electrician's basic tool kit
Wiring system with power source

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Cut conductors at wall box to leave six inches of free conductor.
6. Run power cord from appliance to junction box through approved cord connector.
7. Remove approximately 3/4's inch of insulation from each conductor.
8. Make connections in junction box using correct connector and methods and observing correct polarity.
9. Install cover on junction box.
10. Turn power on for appliance circuit.
11. Turn appliance control switch on.
12. Assure required operation.
13. Turn appliance off.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

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PERFORMANCE OBJECTIVE B-6.9

TASK: Connect three-way switches.

STANDARD OF PERFORMANCE OF TASK:

Connections of wiring to switches shall be done in accordance to governing specifications and code requirements, and must be mounted in a manner to present a uniform appearance.

Light or other device must be controlled on or off from all locations.

SOURCE OF STANDARD: Writing Team

V-TECS: House Electrican, 1981, p. 120
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Wiring system with power source
3-way switches

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Cut conductor at wall box to leave six inches of free conductor.
6. Remove approximately 3/4's inch of insulation from each conductor.
7. Identify conductors.
8. Connect source or hot lead to identified switch terminal at one switch location.
9. Connect travelers to either of other two terminals on switch.
10. Connect switched leg to identified switch terminals at second switch location.
11. Connect traveler to either of other two terminals at second switch location.
12. Attach switches to wall boxes.
13. Install cover plates.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

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PERFORMANCE OBJECTIVE B-6.9 continued

TASK: Connect three-way switches.

PERFORMANCE GUIDE continued:

14. Turn power on.
15. Assure required operation of switch at both locations.

COMPETENCY: B-6 Trim out electrical devices and appliances to meet local code

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PERFORMANCE OBJECTIVE B-6.10

TASK: Connect four-way switches.

STANDARD OF PERFORMANCE OF TASK:

Connections of wiring to switches shall be done in accordance to governing specifications and code requirements, and must be mounted in a manner to present a uniform appearance.

Light or other device must be controlled on or off from all locations.

SOURCE OF STANDARD: Writing Team

V-TECS: House Electrican, 1981, p. 120
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Wiring system with power source
Four-way switches

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Read manufacturer's installation instructions.
5. Cut conductor at wall box to leave six inches of free conductor.
6. Remove outer sheath leaving approximatley 1/2 inch protruding to remains in box.
7. Remove approximately 3/4's inch of insulation from each conductor.
8. Identify conductors (at least four).
9. Connect conductors to appropriate terminal on switch as per diagram supplied by switch manufacturer.
10. Attach switch to wall box.
11. Install cover plate.
12. Turn power on.
13. Operate switch at each location to determine if circuit can be turned on and off.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.1

TASK: Replace fuses.

STANDARD OF PERFORMANCE OF TASK:

Replaced fuses.
Complies with National Electrical Code standards.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 68
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given assortment of fuses
Electrician's basic tool kit

PERFORMANCE GUIDE:

1. Turn power off serving fuse panel.
2. Remove cover from fuse panel so wire size can be observed if there is a question as to fuse size.
3. Check wiring connections.
4. Insert all fuses of correct size and type. Be sure all fuses are tight in holders.
5. Turn power on.
6. Check voltage with tester at each fuse holder.
7. Replace fuse panel cover.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE: B-7.2

TASK: Replace existing receptacle or switch.

STANDARD OF PERFORMANCE OF TASK:

Switch and/or receptacle replaced with one of same type and voltage rating as original.

Switch and/or receptacle mounted same as old -- in place, straight, plumb.

Complies with National Electrical Code standards.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 67
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Receptacle/Switch
Installation materials

PERFORMANCE GUIDE:

1. Turn power off.
2. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
3. Remove switch or receptacle from box.
4. Disconnect conductor from existing receptacle and switch.
5. Connect switch or receptacle observing correct polarities.
6. Connect ground wire to grounding terminal on receptacle.
7. Push switch or receptacle into outlet box and tighten screws.
8. Replace outlet covers.
9. Turn power on.
10. Check for proper polarity.
11. Turn switch on.
12. Assure receptacle/switch.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.3

TASK: Replace cable.

STANDARD OF PERFORMANCE OF TASK:

Replaced cable complies with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 65
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given cable
Electrician's basic tool kit

PERFORMANCE GUIDE:

1. Locate installation point.
2. Turn power on.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Remove old cable being replaced.
5. Terminate cable inside an enclosure through approved connectors.
6. Connect cable to terminals or splice to other conductors with approved splices. Connections must be tight and polarity correct.
7. Tape or otherwise insulate connections to withstand applied volatge where required.
8. Turn power on.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.4

TASK: Replace grounding electrode conductor.

STANDARD OF PERFORMANCE OF TASK:

Grounding electrode conductor installation made using methods and materials appropriate for conditions encountered.

Complies with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 69
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given grounding electrode conductor
Electrician's basic tool kit
Installation materials
Work order

PERFORMANCE GUIDE:

1. Call power company to turn power off.
2. Determine that power is off by checking conductor(s) at point of connection(s) with voltage tester.
3. Locate termination points of conductor.
4. Loosen terminals and remove defective conductor from terminals and structure.
5. Apply corrosive inhibitor, if required by local authorities.
6. Terminate grounding conductor at points designated by authority having jurisdiction.
7. Fasten conductor to previously installed grounding electrode with clamp approved for direct burial.
8. Attach conductor securely to structure.
9. Call power company to turn power on.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.5

TASK: Replace existing interior load center.

STANDARD OF PERFORMANCE OF TASK:

Load center replaced with approved equivalent parts.
Complies with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 64
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given load center
Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Turn power off.
2. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
3. Remove wires from old box and mark circuits.
4. Remove old box.
5. Attach new load center to structure.
6. Connect existing wires to new load center.
7. Insert breakers of proper size and type.
8. Connect existing wires to breakers.
9. Turn power on.
10. Test all circuits.
11. Fill out circuit directory.
12. Replace cover.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.6

TASK: Repair/replace service cords.

STANDARD OF PERFORMANCE OF TASK:

Defective parts replaced with equivalent part.

Insulating materials and cord has required size and type for conditions encountered.

Complies with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 63
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given service cord
Electrician's basic tool kit
Installation/electrical materials

PERFORMANCE GUIDE:

1. Turn power off.
2. Determine that power is off by checking conductor(s) at point of connection(s) with voltage tester.
3. If replacement of service cord is made, cord must be sufficient size for load being served.
4. Remove old cord from appliance and points of attachment.
5. Attach new cord to appliance and secure ends of cord in boxes, leaving sufficient free ends for connections. Maintain strain relief if necessary.
6. Remove sufficient insulation from conductor ends for connections.
7. Connect ends of cable to existing wires or terminals making sure polarity is correct.
8. Turn power on.
9. Check circuit being served for required voltage and polarity.
10. Assure required operation of appliance.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.7

TASK: Repair lights.

STANDARD OF PERFORMANCE OF TASK:

Diagnosed and replaced defective parts with approved equivalent parts.

Light works when repair completed.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 59
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Light parts
Electrician's basic tool kit

PERFORMANCE GUIDE:

1. Remove and test bulb with ohmmeter or other means.
2. If bulb is good, use volt meter to check for correct voltage at light fixture connections.
3. If voltage is correct in fixture connections, fixture must be repaired or replaced.
   a. Turn power off.
   b. Remove fixture.
   c. Repair or replace fixture.
   d. Re-install fixture.
4. If voltage is incorrect, check/correct for problems at power supply.
   a. Measure continuity of fuse(s)/breaker(s).
   b. Remove/replace faulty fuse(s)/breaker(s).

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.8

TASK: Diagnose/repair fluorescent fixture.

STANDARD OF PERFORMANCE OF TASK:

Diagnosed and replaced defective parts with equivalent parts.

Fixture works.

SOURCE OF STANDARD: V-TECS: House electrician, 1981, p. 58
National Electrical code

CONDITIONS FOR PERFORMANCE OF TASK:

Flourescent fixture parts
Electrician's basic tool kit

PERFORMANCE GUIDE:

1. Check voltage with volt meter.
2. With proper voltage at fixture and power on, visually check bulbs for darkened ends, buring red at ends, or flashing on and off. Replace bulb if any of these conditions exists.
3. If bulbs are not defective, determine if fixture is self-starting or uses separate starters. If it has starters, replace with new ones of correct size.
4. If bulbs and starters are not defective, turn power off.
5. Remove cover from fixture and check wiring inside fixture for loose connections.
6. If wiring is not loose and bulbs and starters are not defective, replace ballast.
7. Re-install cover and other parts removed for wiring inspection.
8. Turn power on.
9. Assure fluorescent light operation.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.9

TASK: Test for correct voltage.

STANDARD OF PERFORMANCE OF TASK:

Voltage equal to unit data plate requirements or the same as supplied by the power distributor for a given circuit.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 74
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given a power source
Electrician's basic tool kit

PERFORMANCE GUIDE:

1. Locate circuit to be tested.
2. Determine what voltage should be.
3. Turn circuit on at the distribution service panel or switch.
4. Check voltage using voltmeter.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.10

TASK: Trouble shoot existing circuits.

STANDARD OF PERFORMANCE OF TASK:

Circuit checked for open circuits, short circuits, correct voltage, and correct polarity.

All connections tight and the circuit functions.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 75
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given a defective circuit
Electrician's basic tool kit

PERFORMANCE GUIDE:

1. Turn power off, if required.
2. Locate the power source and the route of the circuit to be checked.
3. Remove all cover plates.
4. Check all connections.
5. Check voltage with voltmeter at each outlet beginning at the service panel.
6. Check each outlet for correct polarity.
7. When short, open, or faulty circuit has been located, using ohmmeter, repair or replace the circuit.
8. Replace all protective covers.
9. Turn power on.
10. Assure required operation.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.11

TASK: Repair/replace relays and timers.

STANDARD OF PERFORMANCE OF TASK:

Defective parts replaced with equivalent parts.
Relay/time operates when power restored.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 60
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Replacement relays or timers
Given an appliance with a defective relay or timer
Electrician's basic tool kit

PERFORMANCE GUIDE:

1. Turn power off.
2. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
3. Replace relay or timer with an equivalent part.
4. Turn power on.
5. Assure relay/timer operation.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.12

TASK: Service electric motors.

STANDARD OF PERFORMANCE OF TASK:

Motor cleaned of dust and other foreign materials.
Connections tight, and all bearings greased/oiled.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 73
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given electric motor
Electrician's basic tool kit
Service materials

PERFORMANCE GUIDE:

1. Locate motor to be serviced.
2. Turn power off.
3. Determine that power is off by checking conductor(s) at the point of connection(s) with voltage tester.
4. Remove protective covers as required.
5. Clean motor of all foreign materials (dust, straw, string, etc.).
6. check all wiring connections.
7. Oil or lubricate as required.
8. Replace all protective covers.
9. Turn power on.
10. Assure required operation of motor.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.13

TASK: Repair fire alarm stations.

STANDARD OF PERFORMANCE OF TASK:

Repaired fire alarm station, per National Electrical Code standards.

SOURCE OF STANDARD: Writing team
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Repair materials for fire alarm stations
Electrician's basic tool kit
Test equipment
Work order
Plans and specifications

PERFORMANCE GUIDE:

1. Locate fire alarm installation.
2. Check governing electrical standards.
3. Read manufacturer's repair instructions.
4. Turn power off.
5. Determine that power is off by checking conductors at point of connections with test equipment.
6. check to see that all connections are tight.
7. Turn power on, test circuit.
8. If short, open, or faulty component has been identified; cut power off; repair/replace as necessary.
9. Turn power on.
10. Assure required operation.

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.14

TASK: Repair/replace emergency lighting.

STANDARD OF PERFORMANCE OF TASK:

Wiring kept entirely independent of all other wiring and equipment.

Emergency lights operate when electrical power goes off.

Complies with governing specifications and codes.

SOURCE OF STANDARD: V-TECS: House Electrician, 1981, p. 62
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Given wiring for emergency lighting
Electrician's basic tool kit
Installation materials
Manufacturer's specifications

PERFORMANCE GUIDE:

1. Make wiring connections according to manufacturer's instructions.
2. Connect power to unit and assure required operation.
3. Locate lighting so that designated escape routes are clearly visible.
4. Test productivity.

184

COMPETENCY: B-7 Maintain existing wiring to promote longevity and safety of residence

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PERFORMANCE OBJECTIVE B-7.15

TASK: Repair automatic control systems.

STANDARD OF PERFORMANCE OF TASK:

Automatic control system located and installed per manufacturer's specifications, plans and specifications.

Complies with governing specifications and codes.

SOURCE OF STANDARD: Writing team
National Electrical Code

CONDITIONS FOR PERFORMANCE OF TASK:

Electrician's basic tool kit
Wired system with power source
Automatic control system
Installation materials
Manufacturer's specifications

PERFORMANCE GUIDE:

1. Locate installation.
2. Check governing electrical standards.
3. Read manufacturer's repair instructions.
4. Turn power off.
5. Determine that power is off by checking conductor(s) at point of connection(s) with voltage tester.
6. check to see connectors are tight.
7. Turn power on, test circuit.
8. If short, open, or faulty circuit has been identified; cut power off; repair/replace as necessary.
9. Turn power on.
10. Assure required operation.

ELECTRICIAN'S BASIC TOOL KIT

A basic tool kit for an Electrician, as indicated in the Performance Objectives, includes the following tools:

Allen wrench set, large
Bolt cutter, small
Crimper, terminal
Drill 3/4" or 1" electric
Hack saw
Hat, hard
Knife, electrician
Multimeter - volt ohm, rmp's
Pliers - slip joint 10"
Pliers, lineman
Puller, fuse
Tool pouch and belt
Screwdriver, Phillips - 4" and 6"
Screwdriver, flat - 4", 6", 8", 12" - plastic handle
Wrench, adjustable 8" and 2-16" pipe
Awl, metal
Chisel, wood
Drill, 1/2" electric
File, rattail
Hammer, calw
Hole saw set
Level - torpedo (pocket) 8%
Nut driver
Pliers, diagonal
Pliers, needle-nose
Rule, folding
Wire strippers

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ELECTRICAL

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ELECTRICAL MATRIX

CORE COMPETENCIES	PRIMARY REFERENCES FOR COMPETENCIES	MATH: Adds, subtracts multiplies and divides whole numbers, fractions and decimals.	MATH: Calculates square roots.	MATH: Solves algebraic equations.	MATH: Uses different units of measurements and scales.	MATH: Estimates material quantities and costs.	SCIENCE: Demonstrates knowledge of electrical theory.	SCIENCE: Demonstrates knowledge of electrical physics.	SCIENCE: Communicates effectively both verbally and in writing.	COMMUNICATIVE ARTS: Reads and interprets contract documents, blueprints and schematic drawings.	COMMUNICATIVE ARTS: Uses appropriate vocabulary associated with electrical installation.	COMMUNICATIVE ARTS: Asks appropriate questions to clarify essential building instructions.	COMMUNICATIVE ARTS: Listens to and follows directions.	RESPONSIBILITY SKILLS/COMPETENCIES: Demonstrates flexibility in adapting to new techniques and new materials.	RESPONSIBILITY SKILLS/COMPETENCIES: Keeps work area safe and orderly.	RESPONSIBILITY SKILLS/COMPETENCIES: Manages time effectively.	RESPONSIBILITY SKILLS/COMPETENCIES: Respects authority.	RESPONSIBILITY SKILLS/COMPETENCIES: Adapts to changing job conditions, job sites, and work assignments.	RESPONSIBILITY SKILLS/COMPETENCIES: Exhibits a working knowledge of other construction trades.	RESPONSIBILITY SKILLS/COMPETENCIES: Works without close supervision.	RESPONSIBILITY SKILLS/COMPETENCIES: Demonstrates pride in workmanship.	RESPONSIBILITY SKILLS/COMPETENCIES: Anticipates problems and avoids them.	RESPONSIBILITY SKILLS/COMPETENCIES: Gets along with others and works well as a crew member.
Use and identify tools and equipment to complete work in the electrical trade.	2,5, 1,6				•						•		•	•	•	•	•		•	•	•	•
Read blueprint and schematics to determine location of work to be done.	4,6,11	•			•	•	•	•	•	•	•	•		•	•	•	•		•	•	•	
Compute service loads to meet local code.	7,1, 10,15	•		•	•	•	•	•	•	•		•		•	•	•		•	•	•	•	•
Select and identify material to meet local code.	7,13					•	•		•	•	•	•		•		•		•	•	•	•	
Install and maintain basic electrical circuits to meet local code.	7,10,1	•			•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•
Install lighting fixtures to meet local code.	7,11, 6,1	•			•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•
Install and maintain motors to meet local code.	7,9					•	•	•		•	•	•	•	•	•	•		•		•	•	•
Plan and organize work to schedule manpower and materials.	4,13	•			•	•			•	•		•	•	•		•	•	•	•		•	•
RESIDENTIAL																						
Install and maintain service entrance to meet local code.	7,6,1	•			•	•	•		•	•	•	•	•	•	•	•		•	•	•	•	•
Rough in feeders, branch circuit cables and circuits to meet local code.	7,6,1	•			•	•	•		•	•	•	•	•	•	•	•		•	•	•	•	•
Install lighting fixtures to meet local code.	7,6,1	•			•	•	•		•	•	•	•	•	•	•	•		•	•	•	•	•
Install switch boxes and outlet boxes to meet local code.	7,6,1	•			•	•	•		•	•	•	•	•	•	•	•		•	•	•	•	•
Install environmental control components to meet local code.	7,6,1	•			•	•	•		•	•	•	•	•	•	•	•		•	•	•	•	•
Trim out electrical devices and appliances to meet local code.	7,6,1	•			•	•	•		•	•	•	•	•	•	•	•		•	•	•	•	•
Maintain existing wiring to maintain longevity and safety of residence.	7,6,1	•			•	•	•		•	•	•	•	•	•	•	•		•	•	•	•	•